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CHICAGO, JULY, 1914.

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ERRORS OF THE LAY PRESS.

TECHNICALLY trained editors of daily newspapers are so rare as to be negligible. Therefore the lay reader who relies upon the news press for his knowledge of the advance of science is depending on an informant who knows no more about the subject than does the reader himself. The natural result is that the more spectacular, and therefore questionable, are the reports of a new invention or discovery, the quicker those reports find first page space in the newspapers.

The telephone, mysterious as its workings are, has found opportunity to furnish many a sensation to newspaper readers. The wireless telephone particularly, from the complicated affair of ten thousand mile radius that is supposed to be the well guarded secret of some government (never our own) to the pocket instrument the size of a watch invented by an Italian monk, has found many columns open to it. In the early days of wireless the newspapers took it largely for granted that the new system would shortly supplant the old and wipe out the gigantic wire network of the country.

The latest object of newspaper enthusiasm is the possibility of seeing by telephone—the pretty conceit that it is, or soon will be, possible to gaze soulfully into the eyes of our *viz-a-viz* the while we converse over a thousand miles of wire.

"Television," as it is called, is an accomplished fact—in the laboratory. That is just where the newspaper makes its error. It cannot see the vast chasm which must be filled up before experiment becomes practice. Telephotography, the transmission of pictures by wire, is an accomplished fact—practice, if you like. But television is a far different problem. It bears about the same relation to telephotography that telephony bears to Morse telegraphy.

The day may come when television is combined with telephony—if there ever develops a demand for it, which is not apparent now. But in any event, it will be many years before we can expect such an innovation.

CHICAGO.

ATTORNEY-GENERAL McREYNOLDS' office has declared, in answer to inquiries from interested organizations, that it has its eye on the proposed merger of the Chicago Telephone Company and the Illinois Telephone and Telegraph Company—Chicago's independent automatic system. The department says the consolidation must conform to the Kingsbury letter of December 19, which proposed to submit for the department's approval any combination already in progress but not consummated. That, of course, covers the Chicago situation.

The city ordinance covering the operations of the Chicago independent states specifically that it shall not be sold to the Chicago Telephone Company, and that under certain conditions its plant shall become the property of the city of Chicago. Apparently those conditions now obtain, and it is up to the city to take over the company if it cannot operate itself.

We are distinctly and emphatically antagonistic to the ownership and operation of public utilities by government, state or municipality. But in the Chicago case we seem to have little choice. The only alternative indeed, is absorption by the Bell company; and the economic objections to that course are so great that we cannot see how the city council can entertain the project at all.

The Chicago Telephone Company proposes to buy the independent plant at three times its value. That means an expenditure of some four million dollars for which no benefit is apparent. In an industrial transaction, or even a public utility transaction a few years ago, this would have been nobody's business—and perhaps nobody's loss—but the stockholders'. But today the stockholder is assured his reasonable return on investment by the new utility laws. Whatever the investment may become, the rates must take care of that reasonable return. The excess four millions in the Chicago case becomes investment, whether it is actually invested in anything or not. That makes the public pay the interest. The utility laws and the city council are supposed to protect the public.

As a representative of the operating telephone companies, this paper has no particular duty to protect the telephone-using public. But we believe the law giving investors a proper return is exceedingly just and equitable; and it is only complementary justice to insist on proper investment.

So, under the circumstances, it seems best to carry out the original provision for difficulties, and let the city take over the plant. After all, we might like the arrangement; for we would then have an object lesson whenever we might wish to discourse on the troubles of political telephone operation.

THE EXCHANGE LINEMAN.

A WORKMAN is really a good workman only when he is preparing himself for a superior position and is willing, on occasion, to do the work of an inferior position. The duties of an employe may be very specific and of definite boundaries; but his duty to himself generally demands that he cross those boundaries both forward and backward whenever opportunity in the one case, and exigency in the other, point the way.

An exchange lineman's position may not appear at first glance to be very complex or difficult; but the lineman who does all that he finds to do, and does it well, becomes potential timber for one of the bigger jobs of telephone operating.

To dig holes and properly set poles in them; to frame the poles and set the crossarms square on the gains; to install guy wires without leaving rough ends protruding; to handle a soldering iron expertly and freely, and to know a true soldered joint from a "solder-plated" joint; to hang drop wires so they cannot swing to a cross or ground; these are but the simple duties of the lineman.

His greater duties are not at all unlike those of any other employe who would be loyal, efficient and progressie: to report punctually, to be off the job only by permission, to be on the job whether he is being watched or not, to quit only when it is time to quit.

It is his immediate duty to himself and his family to be sure that poles, crossarms and seats are safe before he ventures upon them, and never to let familiarity with neighboring high tension wires become contempt; for a high voltage circuit is no respecter of persons, and will lay out a lineman as soon as a farmer.

It is his part as a good workman to make all his work permanent, never to avoid responsibility, never to repeat mistakes; to learn the running of interior wiring and installing and the inspection and care of telephone instruments; and, when that brings him in contact with the public, to remember that he is the company, and to be always courteous and patient.

These few rules, observed in the spirit as well as the letter, will make him more than a lineman.

TELEPHONE SLAVES.

WE READ in the newspapers last month that Dr. Georg Brandes, the greatest literary critic, had given vent to the following utterance:

"Your liberty? What is it that you call your liberty? I think you have less liberty in America than we have in Europe—less personal, individual liberty. In this country you are all slaves of the telephone. The American telephone is the worst instrument of torture that ever existed. The medieval rack and thumbscrews were playthings compared to it. And from it one can never get away. I sit here talking to you in this cool corner of the restaurant. Somewhere out there the telephone bell rings, and a person demands to speak with me. I must get up and answer him, and if he called at any hour of the night it would be the same. Am I free? No."

And we immediately recalled the famous retort of E. H. Harriman, the late railroad magnate, when he was accused of being a slave to the telephone.

Harriman, it will be remembered, was a real telephone "fan." He had telephones everywhere—even in his bath. Nowhere was it necessary for him to move more than a step to answer or originate a call. And he did both—several hundred a day. He thought no more of entering a thousand mile toll call than the average man does of making a local connection. So they called him a slave to the telephone. And he replied:

"Nonsense! The telephone is a slave to me!"

It is all a matter of temperament. Brandes is a European, *and* a literary critic. Perhaps if he were a European business man, or even an American literary critic, the annoyance of the telephone would never have occurred to him.

The telephone—the American telephone—is insistent. We cannot avoid it. We may want to loaf a little, or dream, or take a nap. The telephone will not let us. It insists that we stay on the job whether we will or no. It makes us attend to our business, and so it makes our business better and keeps us alert and energetic and progressive.

Even the healthiest of us would not like to be told we were slaves of our stomachs. Yet when the time comes we must eat—regardless of what else, seemingly more important, is at hand. If we ignore the call we invite indigestion and dyspepsia, and so lower our efficiency.

We do not have to answer the telephone. We may even, if we wish, muffle the bell so that we cannot hear it. But we know that if we do that we are deliberately and

uselessly sacrificing a very important thing. We are locking the door that opportunity most favors.

Temperament makes the viewpoint. Dr. Brandes sees the telephone call as an intruder upon his seclusion, a besieger of his quiet. We see it as something for us, a mysterious present from a mysterious donor, and we accept it instantly. For good experience has shown us that without it we would indeed be the slaves of unfinished business. No, indeed; the telephone is a slave to us.

BACKING DOWN ON RATES.

FROM Prescott, Ark., comes a brief and perfunctory dispatch that says the patrons of the local telephone company have won their fight against increased rates. The company has promised to be good and get along with the old charges, and the people have started using their abandoned instruments once more.

The size of Prescott, or that it is in Arkansas, is unimportant. The thing is that the company failed to raise its rates. Now, either the company did not need higher rates and was trying to put one over on the public, or it did need higher rates and the public put one over on it. There is no compromising ground.

The condition illustrates the difference between a merchant and a utility. If you went to the Prescott jeweler to buy a ring, and if he asked you twenty dollars for it and you beat around until you got it for fourteen dollars, you would both be pleased. You would have saved six dollars, and he would have made a profit on the sale. For no law says whether the jeweler shall make seven, or a hundred, or two hundred per cent on his investment.

But the utility is giving public service with one hand, and paying interest on investment with the other. Public service demands that the rates be as low as will properly operate the plant and pay reasonable interest on the money. The investment demands that the rates be high enough to pay the interest with absolute certainty. And these requirements hold good whether there is a utility commission or a state law to enforce them or not. Therefore, for every utility there is a certain definite and specific rate schedule that is correct, and any departure from that schedule is in error.

If the Prescott company has been forced to return to its old schedule it must be losing money. That means that ultimately the stockholders cannot expect to get the proper interest on their investment. Or if the company is not losing money, then the rate raise which it tried to put into effect, and failed, was arbitrary and unjust, and with it the company would have made more money than it was entitled to. There is no other answer.

It is a simple thing to say, "We want to raise our rates, but they won't let us"; but there is a good deal more to the proposition than just that. That jeweler, if he paid fifteen dollars an ounce for gold and then sold it at the rate of seventy-four cents a pennyweight because the people refused to pay any more for it, would not last long. Neither will the company whose service, rent, taxes, depreciation and interest costs twenty-five dollars per year per telephone, and whose average rate is two dollars a month.

Prescott's case is not at all unusual; only the Prescott company actually raised its rates and had to back down, while a good many companies never screw their courage up to the point of making the raise.

The only solution of the problem is for the company—*every* company—to figure to the last decimal, by the most approved method, and with every item allowed for, what the service costs; then to divide the result into rates, and stick to the schedule regardless. It may be necessary and desirable to let the public in on the figures; publish them and explain them. But, anyway, find out what the proper schedule for the system is; there is only one proper schedule. And then put it into effect. If there is a commission in authority, it will help; if there is none, it may be necessary to rely on the people's sense of justice, which is always safe enough if the matter is properly presented.

COMPANY AS A SUBSCRIBER.

IN KANSAS the Public Utilities Commission has ruled that a telephone company desiring to patronize the service of another telephone company has the same rights as a private individual and must be furnished with it as promptly and fully as is an individual. The Northeast Kansas Telephone Company, operating in a number of the northeastern Kansas counties, filed complaint against local companies in Hiawatha, Morrill and Robinson, because of their refusal to furnish telephone service on the grounds that it was an opposition company. The utilities commission sustained the cause of complaint and ruled that the local companies must give the service desired at ordinary rates.

This is a sort of common-sense short cut to physical connection. All a company has to do is to subscribe to the service of its competitor, install a p. b. x. board, and give "universal service."

THE GOVERNMENT TELEPOST.

SENATOR OWEN is working hard in Washington and New York to get the United States Government and the Telepost Company into combination. His idea is to establish an electric mail, with special issues of ten and twenty-five cent stamps to cover the transmission of ten and fifty word messages. The messages are to be mailed as letters, transmitted by Telepost between post-offices, then rewritten and delivered with ordinary mail.

It thus becomes evident that the old adage about choking a cat with cream and alternative methods of eliminating it applies also to government ownership of wire systems. There are more ways than one of getting Uncle Sam into the telegraph business.

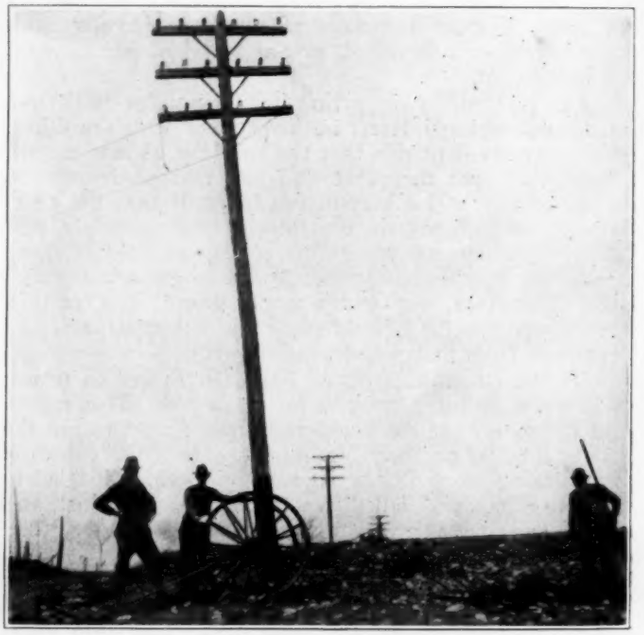
COURT APPEAL BY TELEPHONE.

THE question whether the telephone may be used to appeal against a decision was recently decided before a German court. Appeal may be made either in writing or in verbal form, but it must be within the time limit set by the courts. A householder intended to appeal against a decision, and thought of the time limit only on the day when it was ending. It was impossible to reach the court by letter and so he had himself connected by long distance with the judge and placed his appeal. The court, however, did not admit this appeal, stating that this appeal could only be allowed if the courts were able to prove that the speaker was the person whom he represented himself to be. In telephone conversation the identity of the speaker cannot be proved. While it may be true in most cases that the plaintiff was really the one making the call, there is the possibility of an interested third person making the appeal to the harm of the first person. For that reason the court refused to allow the appeal to stand.

How the Chain Is Fastened to the Pole and Then Wound Around the Iron Pipe Axle.

Method of Operating "the Bull."

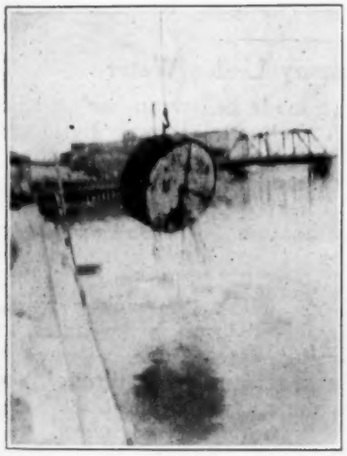
"The Bull" in Action. A Closer View, Showing Pole Held Out of the Ground.



The Weight of One Man Standing on the Lever Bar Is Holding the Pole Up Out of the Ground.

A. M. Williams, Petoskey district office of the Michigan State Telephone Company, has built a machine to expedite pole moving where the poles are to be moved to one side to make room for road improvement. A heavy pair of wagon wheels, heavy iron pipe, together with a doub e test chain make up the parts of the machine. It is possible with this device to lift a pole out of the ground without digging around it. The strength of one man is often adequate to raise the pole. Two hand lines are used to steady the pole and it is then wheeled to its new location. Where the new location is but a few feet from the old hole and the wires do not have to be touched, the machine is a great time saver. Recently it has been used very successfully under the direction of Foreman Morseman, in an extensive pole removing job near Charlevoix. The men who have had the advantage of this machine had christened it the "Bull" in tribute to its strength. The pictures on this page show the machine in operation.

STORIES IN PICTURES OF TELEPHONE PRACTICE AND PROGRESS IN ALL PARTS OF THE WORLD.



A reel of cable delivered at the Chicago river bank was placed thirty or forty feet from the edge of the dock and blocked. Jesters in the neighborhood pried the blocks away from the reel and rolled it into the river. A diver sent down found the reel lying on its edge, nearly half buried in the soft mud. After some difficulty, the reel bar was placed through the hole of the reel on his second descent and on his third he took with him a heavy chain. The diver fastened the steel hoisting cable to the chain on the reel and with much difficulty the $500 worth of cable was rescued.

The Telegraph and Signal Corps of General Villa's Army During an Engagement with Huerta's Forces. Copyright Mutual Film Company.

A Moving Telephone Exchange.

At Stanwood, Wash., it became necessary to change the location of the Pacific Telephone Company's exchange. A new location, 110 feet away, was secured for the building, and the office was moved from the old to the new location on April 14. Temorary cable was placed in rollers suspended from the messenger carrying present cable to the point to which the office was to be moved, the end of the temporary cable being carried back to the office and hung loosely from the messenger. The slack end of the temporary cable was taken through a hole in the front of the office and formed up on the fuse strips, the underground lateral being cut out of service. Two hundred and fifty feet of 150-pair 22-gauge cable suspended on eight cable rollers were used in the operation. Service was kept up during the entire time of the transfer, subscribers not even knowing of the situation.

STORIES IN PICTURES OF TELEPHONE PRACTICE AND PROGRESS IN ALL PARTS OF THE WORLD.

No Discrimination in Pennsylvania

Rates charged by telephone companies must be the same to all subscribers enjoying the same class of service, under an opinion handed down by the Pennsylvania Public Service Commission in the case of the complaint brought last January against the Economy Telephone Stock Company by the Somerset Telephone Company, in Somerset county. It makes no difference whether the subscriber is a stockholder or not.

The Economy Telephone Company, it developed during the hearings, charged stockholding subscribers $2 less per year than others were charged. The commission orders it to cease such discrimination and also to cease furnishing free service at hotels and railway stations, which is held to be a violation of the public service company law in discriminating against other patrons. The opinion was written by Commissioner M. J. Brecht.

In setting forth its own side of the lower rate allowed stockholders, the Economy Telephone Company said that it builds new lines and furnishes service in new territory only after a subscriber takes stock and that the practice has been found to be a necessary inducement in developing its business. The company held that, therefore, the stockholding subscriber really builds the lines and that he should receive some consideration because of the capital he invests and the risk he runs.

The Public Service Commission holds that the same argument could be applied to any stock telephone company and that whether the money to build a line, etc., is supplied by an outsider or by some one who expects to use the service of the company does not alter the status of a public service company which is required by law to furnish service at rates which shall not be unreasonably discriminatory. It further holds that to grant lower rates to stockholders must be regarded as a discrimination. It further holds that such a practice would open the way to all sorts of abuses as to rates and dividends, etc.

Connecting With Private System

A voluminous and apparently serious complaint has been filed by the Leeds Company with the Interstate Commerce Commission against the American Telephone and Telegraph Company, asking, in effect, that the commission establish through routes and joint rates, with proper divisions between the private exchange of the complaining company, in the Hotel Chalfonte, in Atlantic City, and the long distance stations of the respondent company in other states. The complainant gives what it calls a history of the disagreements between itself and the telephone company, growing, as it insists, out of the desire of the long distance company to control the wires and instruments in the hotel, under, as the complainant asserts, pretense that such control is necessary to prevent "cross connections" between the Bell system and an independent system which the Leeds Company permits to use its terminals.

The disagreements have been going on for six or eight years, and the complainant charges, among other things, that the respondent, in defiance of an agreement, has used conduits intended and reserved for wires other than those of the respondent company, and in other ways acted in disregard of the property rights of the respondent in what the Leeds Company avers to be its determination to monopolize the interstate message business of guests of the hotel who desire to use the independent long-distance system.

The respondent company disavows any desire to force cross connections, but points out that the respondent allows cross connections at other points, and at other points furnishes long-distance service to independents under conditions such as prevail at the Chalfonte, but refuses to furnish such service for the Leeds Company.

The case is important because it involves the use of private equipment in connection with public wire systems.

Attorney-General Watching Chicago

Three letters from the office of the Attorney-General of the United States have been presented to the Chicago council committee on gas, oil and electric light in connection with the protest against the sale of the automatic telephone plant to the Bell telephone interests. These letters are held by the opponents of the proposed sale and are interpreted as indicating that Attorney-General McReynolds is opposed to the merger if it conflicts with the anti-trust laws.

One of these is held by Mrs. Charlotte M. Rhodus, head of the Woman's party. Another was received by Morton L. Johnson, president of the Penny Telephone League, and the third by W. S. Vivian, secretary of the Independent Telephone Association. The letter to Mr. Vivian, signed by G. Carroll Todd, assistant to the Attorney-General, says in part:

> If the Bell company shall attempt to consummate its contract for the purchase of the property of the Illinois Telephone & Telegraph Company without first submitting the matter to the department, as provided in second section of its letter to the attorney general under date of December 19, 1913, the department will take appropriate action.

The letter to Mr. Johnson with the same signature, dated May 19 last, has a paragraph reading:

> There is no reason to believe that the Bell company will attempt to consummate a merger with the Illinois Telephone & Telegraph Company without first submitting the matter to the department, as provided in its letter to the attorney general, dated December 19, 1913.

The letter to Mrs. Rhodus is said to be along the same general lines.

Wireless Telephony Under Water

Experiments have been made in Boston harbor with a newly devised submarine wireless telephone. By means of this apparatus, which is the invention of Prof. R. A. Fessenden of Boston, men standing upon the deck of a vessel, it is claimed, could hear distinctly the conversation of men on the deck of another vessel 150 feet away. Professor Fessenden claims the device will work successfully over a distance of eight miles, and that it has worked as far as thirty-one miles, the spoken words being as easily heard, transferred through the water, as if spoken through the ordinary telephone.

The sound vibrations are transferred through the water rather than through the air, these vibrations being given out by means of a dynamo and large reproducing disc, and received upon the other vessel by an oscillator which transforms the water vibrations into sound at the ear piece. One of the strong claims made for it is that it is capable of receiving and giving back echoes from distant shores, and one of its rather remarkable accomplishments is that of having received, it is claimed, the echoes given off faintly, but distinctly, from an iceberg two miles distant. This being true, the submarine telephone, under perfect working conditions, might have been the means of saving the Titanic, and more certainly it probably would have prevented the recent disaster in the St. Lawrence River.

Toll Telephone Traffic

Presented Before the American Institute of Electrical Engineers, June 26

BY FRANK F. FOWLE

Experiments are described to determine the relationship between telephone circuit loads and the corresponding delay to traffic. The operating methods employed and the number of circuits available determine in general the number of messages per day which can be handled over a single toll circuit. The average delay to traffic obviously depends upon the number of messages per circuit per day, or the circuit loads. With a given load factor, increase in the circuit loads will increase the average delay to traffic. At the same time the revenue per circuit mile will correspondingly increase. The practical limit, however, is approached when the delays to traffic reach a point where the service is unsatisfactory. The results of the experiments described illustrate the fact that increasing circuit loads increase the delay to traffic, and vice versa. The revenue per circuit mile is directly proportional to the product of the circuit load and the toll rate per minute-mile; consequently the relationship between the quality of service and the toll rate is generally obvious, assuming a certain rate of return on the plant investment.

THE number of telephone messages per day which can be handled over a single toll circuit, as is well known, depends upon several considerations. Chief among these are the operating method employed and the number of circuits required to handle the total traffic between the given terminals. A complete dissertation upon toll operating methods would extend far beyond the scope of the present paper, and only the simplest or fundamental methods will be mentioned. The earliest method, and one still used to a great extent in handling small volumes of traffic, is the direct ring-down, in-and-out ticket (or two-ticket method). In this method the operators signal each other direct, over the talking or message circuit by ringing in the usual manner; the outward operator makes a complete ticket, and times and supervises the connection; the inward operator also makes a duplicate ticket, but does not time the connection. This method has been materially improved by eliminating the inward ticket, and by having the outward operator deal directly with the called party at the destination instead of through the intermediary of an inward operator who repeats the details back to the outward operator. In some cases the last method has been modified to the extent of having the inward operator make a memorandum ticket or so-called skeleton ticket, for checking purposes, but this is usually eliminated if possible. Other operating methods, special in their nature, apply when the volume of traffic is very large, but do not come within the scope of the present discussion.

It is not necessary to dwell at length upon the fact that the number of messages per day, per circuit, increases (other factors being the same) as the volume of traffic and the number of circuits operated in one group to handle it also increase. That is, the circuit efficiency increases as the number of circuits or trunks in a group increases, and more messages per circuit, per day, can be handled in a large group than a small one, with the same average delay to traffic and equal load factors.

The effects of the operating method and the size of the trunk group upon the circuit loads (messages per circuit per day) are usually discussed from the standpoint of a certain fixed quality of service; that is, a certain average delay to traffic which is maintained as a standard. This period of delay is generally accepted as the interval from the time the calling subscriber gives his call to the recording operator until the line operator establishes the connection or returns a definite report in regard to the called party. It seems fairly obvious, however, that there must be some definite relation between the circuit loads and the average delay to traffic. In other words, with a constant load factor, the effect of increasing the circuit loads will be to increase the average delay to traffic; at the same time the toll revenue per circuit-mile will correspondingly increase. Naturally a limit will be approached when the traffic is delayed to such an extent that subscribers complain of the delay and a loss of business is threatened.

This relationship between circuit loads (traffic density per circuit) and average delay to traffic, if not already clear, can be illustrated by a simple analogy with railway transportation. Given a fixed volume of traffic (passenger or freight) to be transported, the delays in traffic movement will be least when the train service is as frequent as it is possible to arrange it; but unless the volume of traffic is very large, the train loads may not be large enough to produce an adequate net revenue per train mile. In order to increase the train loads to a point where the operating revenue per train mile will exceed the cost by a reasonably profitable margin, it will perhaps be necessary to resort to less frequent train service. This implies a longer average interval between trains, and consequently a longer average period of waiting or delay before the traffic is moved. The parallels in the analogy are between the number of trains and the number of toll circuits, between train loads and circuit loads, and between delays to railway traffic and to toll traffic, a fixed volume of traffic in each case being assumed.

The general problem is therefore one of the highest commercial importance, since it is perfectly obvious that under a given schedule of toll rates there is a certain standard of service which cannot be exceeded without the sacrifice of profits, and the faster the service as a whole the higher must be the rates for the same percentage of profit. It is not at all the intent in this paper to reach any conclusions as to the commercial side of the question, but simply to present certain experimental data bearing on the general principle.

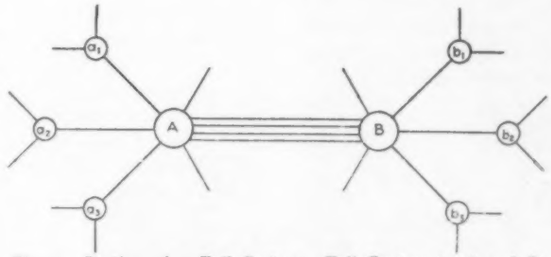


Fig. 1.—Portion of a Toll System. Toll Centers to A and B.

LAYOUT OF EXPERIMENTAL CIRCUITS.

The general layout of the

toll lines used in the experiments here described is shown in Fig. 1. The group of circuits upon which the experiments were made extended between A and B, the latter representing two toll offices, or toll centers. The greater portion of the traffic either originated at A and terminated at B or vice versa. The remainder of the traffic was of a through (instead of terminal) character, necessitating the use of tandem circuits. For example, a call originating at A and destined for b_2 or some point beyond, would have to be switched at B; in some cases the call would be passed to the operator at B, who would take the details and record them on a through ticket, and then pass the call to b_2, while in other cases the operator at B would connect the line through to b_2 and the operator at A would pass the call to the operator at b_2. The entire traffic passing over the group of circuits between A and B can be classified as follows, for convenience:

TABLE I.

Classification of Traffic Over Group of Circuits Between A and B in Fig. 1.

A to B B to A	Class 1
A to b_1 or b_2 or b_3 B to a_1 or a_2 or a_3	Class 2
a_1 or a_2 or a_3 to B b_1 or b_2 or b_3 to A	Class 3
a_1 or a_2 or a_3 to b_1 or b_2 or b_3 b_1 or b_2 or b_3 to a_1 or a_2 or a_3	Class 4

Normally there were six circuits between A and B; this number was reduced successively to five and then to four, operating for several days under each of the last two conditions in order to secure reliable test data. A study of the traffic was then made from the tickets, excluding any days such as Sunday or Saturday, when the traffic is not normal, and also excluding any days when there was any wire trouble on any of the circuits in the group. Of course it should be understood that the through traffic did not necessarily originate or terminate at the first office beyond A or B, but in some cases involved offices reached by two or more switches.

SUMMARIES OF TEST DATA.

The operating method employed in handling the terminal business (class 1 traffic) between A and B (Fig. 1) was the direct ring-down, single-ticket method, while all other traffic was handled by the double-ticket method. The through business was handled in some instances by means of relays, or through tickets at the switching point, and in other cases by straight switches (no ticket).

The summary of results is presented in Table II. Recapitulating, the class 1 traffic is the terminal business between A and B (Fig. 1), the class 2 traffic is the through business originating at A and B, the class 3 traffic is the through business terminating at A and B, and the class 4 traffic is the through business to and from points beyond A and B, but passing over the circuits between the latter. There was no simple way of determining whether each through switch at A and B was set up for the transmission of a message, but in general the number of switches exceeds the corresponding number of messages, and it was arbitrarily assumed that there was one message for every two switches. The average duration of a message was approximately four minutes. The rate schedule in force was the same throughout each 24-hour period.

Table III shows a summary of lost and delayed business, for the same periods as represented in Table II. In all cases the traffic figures represent one day's business, being an average of several day's business, as indicated in the last column in Table II.

DISCUSSION OF RESULTS.

The relationship between the average delay to terminal business (class 1 traffic) and the circuit loads is plotted in curve (1), Fig. 2, the similar relationship for the originating through business (class 2 traffic) is plotted in curve (2), Fig. 2. The underlying data is taken from Table II. These curves bring out forcibly the general conclusion of the paper, namely, that increasing circuit loads are accompanied by increased average delay to traffic. For example, taking the terminal (class 1) traffic, five-minute service corresponds to a circuit load of 21 messages per circuit per day, in a group of about 8 circuits; six-minute service corresponds to a circuit load of 24 messages per circuit per day, in a group of about 7 circuits; seven-minute service corresponds to a load of about 27 messages, eight-minute service to 30 messages, ten-minute service to 35 messages, etc. The following Table IV was prepared in this manner from curve (1), Fig. 2; this of course is based primarily on handling a substantially constant volume of traffic.

The volume of class 3 traffic, Table II, is so small that the data on average delay are unreliable. This is more obvious by reference to a typical load curve, Fig. 3.

TABLE II

SUMMARY OF AVERAGE DAILY TRAFFIC OVER THE GROUP OF TOLL CIRCUITS BETWEEN A AND B (FIG. 1.)

Number of circuits in use	Class 1 traffic		Class 2 traffic		Class 3 traffic			Class 4 traffic			Total number of messages (2) switches taken as 1 message	Number of messages per circuit	Revenue per circuit mile	Number of day's business averaged
					Relayed		Switched	Relayed		Switched				
	Number of messages	Average delay (min.)	Number of messages	Average delay (min.)	Number of messages	Average delay (min.)	Number of switches	Number of messages	Average delay (min.)	Number of switches				
6	124	7.0	19	17.	4	9.2	25	3	14.	2.	164	27.3	$.187	3
5	144	12.2	22	25.	8	5.8	41	3	20.	2.	198	39.6	.255	3
4	140	21.1	17	30	13	21.	43	2	6.	1.	193	48.2	.314	2

Evidently there is a large probability that these relatively few class 3 messages were handled during some other period than the peak, or the "busy hour"; and in such case the delay would be less, owing to lighter loads on the circuits. The same is true of class 4 traffic. The daily load factor was in the vicinity of 30 per cent.

TABLE III.

Summary of Lost and Delayed Business.

No. of circuits in use	Per cent of originating calls (A and B) lost	No. of calls delayed by "no circuit" conditions	Average no-circuit delay, on delayed calls (min.)	No. of calls lost on account of "no circuit" conditions
6	18%	25	11.8	None
5	17%	62	12.9	1
4	21%	99	16.9	1

TABLE IV.

Circuit Loads for Various Grades of Service with Constant Volume of Traffic and a Group of 4 to 8 Circuits.

Average delay to terminal traffic (min.)	Circuit loads in total messages per circuit per day
5	21
6	24
7	27
8	30
9	33
10	35
11	37
12	39
13	41
14	42
15	44

The delay to originating through business (class 2 traffic), destined to scattered points to which the business did not justify individual direct circuits, is shown in curve (2), Fig. 2. Of course this delay can be minimized by eliminating relay tickets at switching points and substituting straight switches.

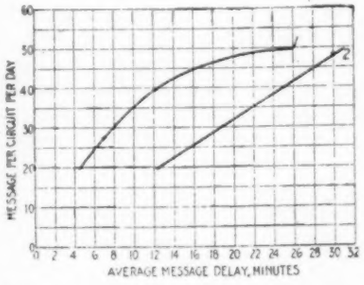


Fig. 2.—Curves Showing the Relationship Between Circuit Loads and Average Delay to Traffic.

Curve (1) for terminal business.
Curve (2) for originating through business.

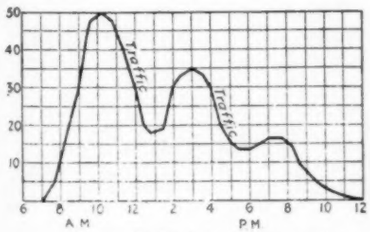


Fig. 3.—Typical Load Curve of Toll Traffic.

The use of averages, particularly in reference to the delays to traffic, does not convey complete information as to the character of service, since some of the calls will inevitably be delayed longer than the average, and others less. In order to bring out fully the quality or speed of toll service it is desirable to resort to curves of the type shown in Fig.4. These curves show the percentage of calls handled with a given delay, or less, and therefore reveal the extremes. The three curves there shown give in more detail the grade of service obtained during the tests whose results are recorded in Table II. Each of these curves applies only to the terminal business, or class 1 traffic; the average delay in each case may be found in Table II.

The results given in the paper, although they apply specifically to conditions which do not differ widely from those described, nevertheless serve to illustrate the fundamental principle that increasing circuit loads increase the delay to service, and vice versa. The revenue per circuit-mile per day, or per annum, is directly proportional to the product of the circuit load and the toll rate per minute-mile. Consequently the relationship between the quality of service and the toll rate schedule is in general an obvious one, assuming of course that a certain fixed percentage of return on the plant investment is maintained in all cases.

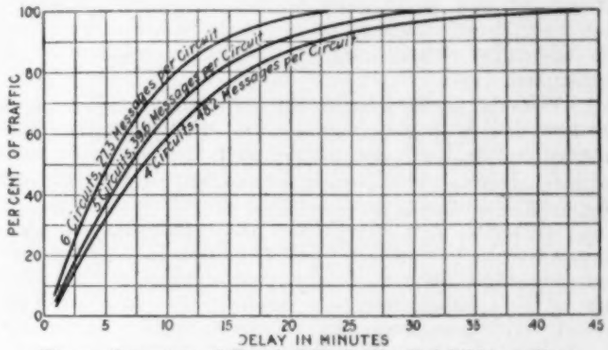

PER CENT OF TRAFFIC
DELAY IN MINUTES
6 Circuits, 273 Messages per Circuit
5 Circuits, 396 Messages per Circuit
4 Circuits, 482 Messages per Circuit

Fig. 4.—Percentage of Terminal Traffic Handled Within a Given Interval or Less.

Pay Telephone Bills at Bank

In order to do away with the annoyance of being called upon by a collector or of having to write a check, mail it and pay the postage, the Lincoln (Nebraska) Telephone & Telegraph Company have devised a plan to facilitate the work.

The plan is for the subscriber to sign a slip sent attached to the statement, which authorizes the bank to accept the bill the same as a check when presented. The bank will include the receipted telephone bill with the cancelled checks in the statement at the end of each month.

This system saves both the subscriber and the company trouble. There is no chance that the subscriber's bank balance will be reduced without his knowledge for the reason that his telephone bill is the same each month.

The telephone company guarantees to refund any amount paid by the bank the subscriber would not have paid if the bill had been presented to him.

Miniature System on Display

The butcher, the baker and the department store man have long been in the habit of displaying their goods, but it is a novelty for the telephone man to do it, at least on the scale that is planned by the New York Telephone Company. District Manager William J. O'Hea said that when the company's Rochester headquarters in North Fitzhugh street are remodeled there will be installed an educational exhibit, designed to show not only the telephone, but the telephone in service. It is planned to have a miniature central office, models of homes, offices and, to show the long-distance service, scenery to imitate hills and dales and lakes.

An exhibit of this kind has been installed in the company's new building in Buffalo on a larger scale and it was one of the things that were pointed out by officials to visitors who attended the formal opening of the new building there.

It is possible that the office boy saves more money than the manager.

Massachusetts Board to Check Long Talks

The Massachusetts Public Service Commission will have at its disposal in the near future exact information which will show who are the most talkative of the subscribers on the party lines of the telephone company, how long these patrons are in the habit of talking and the frequency with which they indulge in endurance conversations.

With the data in hand, the commission will be in a position to devise ways and means of abating the nuisance of longwindedness on the part of telephone users on party lines and of finding a solution of the problem of giving all subscribers an equitable service.

For some time there have been numbers of complaints sent to William H. O'Brien, chief of the telephone and telegraph bureau of the commission, stating that this or that subscriber was holding the line for long periods, to the exclusion of all others on the same line.

It has become a practice, especially in the residential districts, for patrons to discharge their social obligations over the wire, to discuss their household affairs at length, to gossip without interruption, and even to conduct a courtship from receiver to receiver.

All these things take time, and often much time. The telephone company and the commission have no objection so long as no one is inconvenienced, but in the case of party lines there is almost sure to be a stoppage of legitimate calls.

Mr. O'Brien points out that in the case of the four-party lines in particular the subscribing to such service implies a sort of contract on the part of all the subscribers to give to the other subscribers on the line a fair show. This is not possible when one subscriber uses the line for long and continuous periods.

The excluded patron has a just complaint, and to obviate the difficulty the Telephone and Telegraph Bureau is inaugurating a system by which inspectors of the bureau and of the telephone company will observe all lines which are used for long conversations and will report to the commission the facts in each case.

Just what action will be taken when the statistics have been gathered has not yet been decided. In Michigan the commission which conducted a similar investigation ordered the telephone company to install a careful supervision, to caution subscribers who used the party lines unduly, and, as a last resort, to compel the subscriber either to mend his ways or take a service adequate to his needs.

Meanwhile those who use party lines for extended conversations will be watched and their attention will be called to the situation by diplomatic agents of the commission or of the company. Where this has been tried already excellent results have been obtained.

Tri-State Telephone Association Convention

With President W. H. Bryant of Mobile in the chair, and Secretary W. N. McAnge of Corinth, Miss., officiating, the Tri-State Independent Telephone Association met in annual session at Jackson, Tenn., May 21, for a two days' meeting. Mayor C. E. Griffin extended a welcome, which was responded to by President Bryant.

Mr. Bryant in his annual address declared that President Wilson had made one telephone system "be good," and that the Bell company would not likely try to buy up any more independent lines.

W. S. Vivian, secretary of the Independent Telephone Association of America, with headquarters in Chicago, spoke on "The No Account Part of the Telephone Business." He cited the fact that too many telephone companies paid little attention to the operating room, the place where the company meets the public—that these places should be fitted up nicely; that careful selection should be made in the operators, and that girls 18 or 19 years of age made the best operators.

H. L. Shannon of Pontotoc, Miss., spoke on "Does the Toll Line Pay the Little Fellow?" After drawing a picture of the original rural telephone line, Mr. Shannon gave facts and cited instances where the little lines did pay.

F. B. MacKinnon of Washington, secretary of the national association, spoke on "The Interstate Commerce Commission's Accounting System for Small Companies."

J. C. Kelsey of Chicago spoke on "The Treatment of Poles and Cross-Arms."

Terry W. Allen of Jackson, G. A. Joy of Chicago, and J. C. Duncan of Knoxville were on the program.

Chicago Telephone Co. Bought Inter-State Bonds

Upward of $2,000,000 worth of the bonds, a majority of the issue of the Inter-State Telephone and Telegraph Company, for which a receiver has been asked in the United States District Court in Chicago by the Chicago Title and Trust Company, were sold four years ago to the Chicago Telephone Company through former Senator H. H. Evans of Aurora, one of the organizers of the Inter-State Company, the home office of which is in Aurora.

So far as can be learned the bonds bought by the Bell interests have never been marketed. As a result of the sale of the bonds a suit was started on December 13, 1913, in the Cook County Circuit Court by seventy-seven bondholders of the Inter-State company, in which charges were made that former Senator Evans and B. E. Sunny, then head of the Chicago Telephone Company, had conspired to drive the Inter-State out of business.

The Inter-State company passed into control of a Toledo syndicate headed by E. J. Marshall a little over a year ago. This syndicate bought up the greater part of $2,000,000 stock issue of the Inter-State company. The stock had only a nominal value. Shortly afterward $173,000 was borrowed on equipment bonds of the Chicago Title and Trust Company. Interest on these bonds was not met June 1, when due, and the application for a receiver followed. The Inter-State will be sold, an attorney for the Chicago Title and Trust Company said.

The company has about 1,500 miles of telephone lines in Illinois and taps a number of large cities, including Springfield.

Subscriber Resists Pay for Conduit

Suit to test the Cincinnati and Suburban Bell Telephone Company's right to force subscribers to pay for the laying of conduits to lead the telephone wires into their homes was filed in the Common Pleas Court recently by Samuel Froome, of 747 Froome avenue, Winton place. Froome says that he has had a telephone in his home for two years, connecting with wires leading from poles, but the company is installing a conduit for its wires in Froome avenue, and has demanded that he sign a contract agreeing to pay the expense of laying a conduit from the curb-line to his residence, threatening to remove the telephone and discontinue the service unless he agrees to do so. Judge Geoghegan issued a temporary injunction.

The Telephone Scrap Book

Curious and Useful Items, More or Less Telephonic, Gathered from Everywhere

A Pole Hoisting Derrick

THE accompanying illustrations show the construction details of a pole hoisting derrick used by the Public Service Electric Company of New Jersey, and described by W. A. LaDue in the *Electric Journal*. The principal feature or secret of the flexibility of this derrick is in a universal joint at the top of the stationary frame work, which permits the boom or mast to be swung into a position parallel to the highway, or into a vertical position, and also transverse to the platform. This transverse motion allows the boom to be inclined so that the upper end swings over the hole into which the pole is to be set. In order that the boom may be operated quickly and with perfect safety, two guide troughs are built at right angles on the platform, which entirely eliminate any swaying or playing of the boom; and bolts are provided through these guides so that the boom can be stopped at any angle and rigidly secured. The platform frame-work and all wood used in the outfit consist of well seasoned oak, and can be built by any wagon manufacturer or handy carpenter. Provision is made for the use of a back guy, which makes the derrick absolutely secure at all times for extra heavy lifts. The center guy gives a truss effect and is applied for stiffening purposes only, and the portable guy can be fastened anywhere along the road as the derrick is moved. When the boom is reversed for operation on the opposite side of the road, the guys are also changed. The necessary labor to operate this derrick is a team, driver and three men.

An interesting feature is the ease with which the derrick handles poles in locations where trees are very thick and poles are hoisted through the branches, taking branches with it, and even breaking off heavy limbs with no appreciable hindrance or dangerous strain on the derrick.

The tire width of the wheels is six inches, which is good for ordinary country roads; can be used in cities, and is of special importance in fields and on private right of way where the soil is soft. In several instances the derrick was moved 20, 25 and 30 feet, after a pole had been hoisted, in order to get to a hole where the

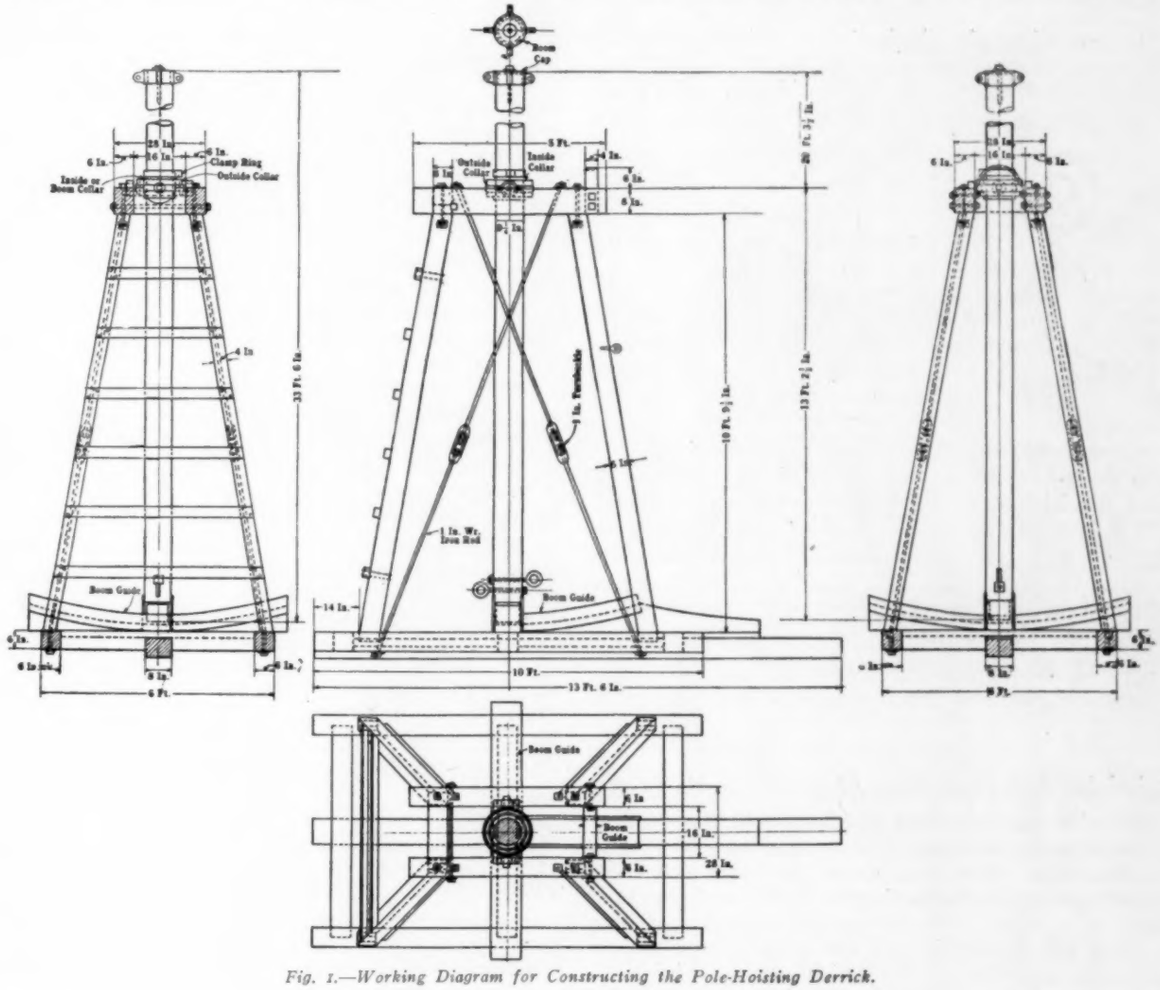


Fig. 1.—Working Diagram for Constructing the Pole-Hoisting Derrick.

pole was to be set, without any danger of toppling over. All poles were hoisted with cross-arms applied and in many instances 6 to 12 arms were bolted to the pole tops, making an added weight of 80 pounds per arm.

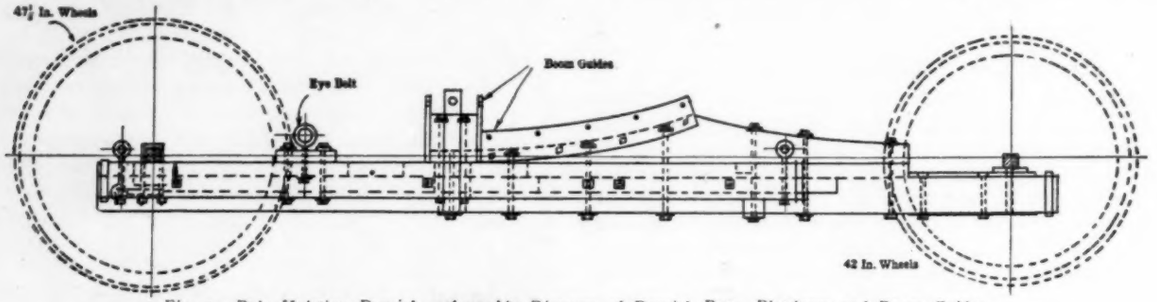


Fig. 2.—Pole Hoisting Derrick. Assembly Diagram of Derrick Base, Platform and Boom Guides.

The general results obtained from this derrick have greatly exceeded expectations. The cost is comparatively small, if its advantages are to be considered, and a great many uses can be made of it aside from setting poles.

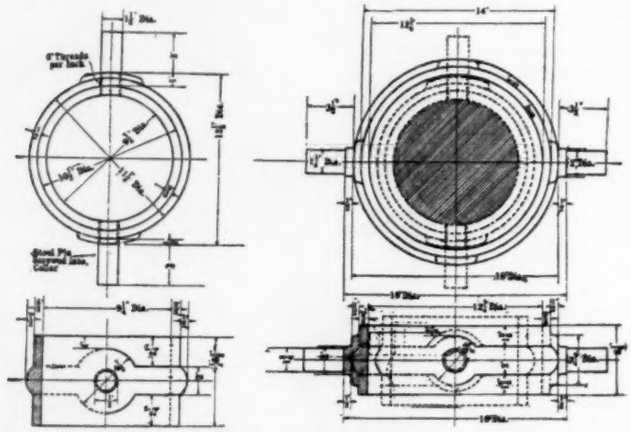


Fig. 3.—Detail Diagram of Inside Boom Collar at Left and of Outside Collar at Right. The Inside Boom Collar Is Shown in Position at the Right by Dotted Lines.

It is particularly adapted for city streets and for loading and handling of poles, transformers and apparatus in general.

Minimizing Induction from Single-Phase Railway

MUCH interest has been manifested in the methods employed to overcome the detrimental effect of the single-phase lines of the New York, New Haven & Hartford Railroad upon neighboring telegraph and telephone circuits. As a result of experiments conducted continuously since the installation of the single-phase system, there have been evolved plans which are now giving excellent satisfaction in practical operation, says the *Electrical World*.

On account of the presence of the lead sheath of the underground cables and the overhead steel structures there is practically no trouble from electrostatic induction along the route of the New Haven road. The chief cause of interference has been magnetic induction attributable to the magnetomotive force of the loop formed by the separated outgoing and return current circuits.

To overcome the troubles encountered use has been made of two general plans that can best be designated as the curative and the preventive. According to the curative plan, the affected circuits are equipped with transformers which introduce compensating emfs proportional to the disturbances. The transformers have primary windings connected in one or more single-phase lines and secondary windings connected in series with the affected lines, the ratio of transformation being so selected as to produce neutralization. This plan is employed by the American Telephone & Telegraph Company on its New York-Boston underground-conduit lines paralleling the New Haven road at a distance of about 2,000 feet.

The plan finally adopted may be called the semi-balanced system. According to this plan all trolley wires are at the same potential, 11,000 volts above the rails. The transmission system and auto-transformer arrangement are as in the first plan, except that the trolley wires are connected together and to one terminal of the transformers, while the feeders, in parallel, are connected to the other.

Fig. 1 is a simplified diagram of the new arrangement. This is evidently similar to the Edison three-wire system, except that the direct load is on one side of the circuit, the other receiving its share through the auto-transformers which perform the same function as balancer sets in a direct-current distribution system.

The Cos Cob power station contains 11,000-volt, three-phase generators, used single-phase for the railroad electrification, but three-phase for the other energy transmission. By means of auto-transformers installed at the power house the voltage is raised to 22,000, and the middle points of the transformers are connected to the rails. Line auto-transformers are arranged along the track and similarly connected for the purpose of reducing the electromotive force to 11,000 volts for the trains. The total number of the sectionalizing bridges at which

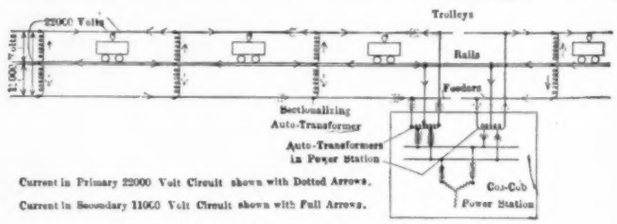


Fig. 1.—Circuit Diagram of Present Arrangement.

the transformers are situated is twenty-five, of which seventeen are west of Stamford.

By the above arrangement approximation is made to ideal conditions for eliminating inductive interference. While data are not yet available to show the exact extent of the neutralization, a very large part of the interference has been eliminated. The reduction of interference is not quite so great as it would be with a completely sectionalized line on account of the general

tendency for some current to flow back to the generating station through the track. That is to say, the magnetomotive forces produced do not quite balance out. This is due to the impedance of the transformers. The effect is similar to the flow of current in the neutral of a three-wire direct-current system. The magnetic effect could in some cases be reduced by disconnecting the track return at the power station, but this would introduce a hazard to the line transformers if a break should occur in one of the line wires. It would be possible in this case that the nearest line transformer would become a raising transformer for the line beyond the break, and might be thus heavily overloaded.

The general return of current toward the generating plant is actually not very great, and the disturbance in adjacent lines has been largely removed. The telephone company has been able to cut down the number of curative transformers to a larger extent, thus improving efficiency of speech transmissions.

Some very interesting and useful experiments are now being made on the New Canaan branch of the New Haven railroad in order to secure a scientific basis for the elimination of inductive disturbances. These tests are being co-operated in by the New Haven railroad, the Westinghouse Electric & Manufacturing Company, the American Telephone & Telegraph Company, the Western Union Telegraph Company, the Southern New England Telephone Company and other interests.

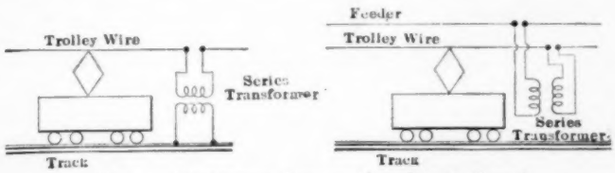


Fig. 2.—Experimental Plan on New Canaan Branch.

The tests were begun on account of a series of disturbances which occurred in the New Canaan office of the Southern New England Telephone & Telegraph Company. The program of the tests was laid out with a view not only to correcting the local difficulties but also to yield data of reference value in the solution of larger problems. The New Canaan branch is well adapted to these tests, as it is off the main line, and is not supplied with the auto-transformers like the main line. In fact, it is not suited for this method of compensation, being a stub-end line.

The plans under test consist of two parts and involve a track and line compensator plan, somewhat similar in principle to the scheme already described for the telegraph line. A series of compensating transformers about one to the mile are distributed along the line, which is between 6 and 7 miles long. These tie together either the trolley wire and the track or the trolley wire and the feeder. The transformers have a one-to-one ratio. The general idea can be seen by inspection of Fig. 2. The currents in the primaries and secondaries of the transformers must be substantially equal, hence at the points where the transformers are applied the currents are confined to the circuit in which the transformers are connected. The transformers obviously neutralize return drop.

The tests are being made with and without the transformers and under all conditions of weather and other variables. To make conditions perfectly definite a current of 200 amp. is sent through the line for night tests, and during the day measurements are taken under regular operating conditions. The measurements are made on lines in the vicinity of the track and at different distances therefrom. In these lines measurements of voltage, current and phase positions are made.

The New Canaan tests are probably the most elaborate which have yet been made, and the results will be awaited with great interest.

Wireless Telephone Used in Business

The wireless telephone was used successfully for commercial purposes, when the Marconi station at the Wanamaker store in New York talked to the Marconi station at the Wanamaker store in Philadelphia for half an hour. Communication was also established with two steamships at sea. One of them was seventy-five miles out.

F. A. Hart and H. Ernest Campbell, the Marconi operators, had been experimenting for several months with the sending of the human voice. At 3:45 o'clock, when the Marconi operator in Philadelphia was receiving messages in the usual dot-and-dash code, he was amazed to hear the human voice, clear as a bell, through his receivers. He called back, using the Marconi code, and found that he was talking to Campbell.

The conversation lasted some time, the Philadelphia end answering in code and New York using the voice. Philadelphia said that the voice was as loud and clear as though the speaker was in the next room. The first commercial business transacted consisted of an order for Philadelphia to ship a quantity of stationery to New York.

The Antilles, of the Morgan line, seventy-five miles out at sea, and the North Star were talked to by wireless telephone about 4 o'clock May 14. They answered in the regular Marconi code and sent their congratulations at the successful completion of the young Marconi operator's work.

Music from a phonograph also was sent over the wireless telephone. The Philadelphia station, the steamship Antilles and amateur wireless stations heard it plainly. As soon as a selection was finished they called up and made comments, using the ordinary telegraphic code.

The first message received by Hart and Campbell were congratulations on their achievement. When the music began to play the comments from the various wireless stations began to be more critical. One operator, identity unknown, but badly wanted by Hart and Campbell, advised them. "Am hearing music clearly, but that's a rotten phonograph. Get a new one and some new records."

A commercial wireless telephone service is to be established between New York and Philadelphia just as soon as it can be made selective.

The Marconi Wireless Telegraph Company has received a dispatch from Guglielmo Marconi announcing that he had completed his wireless telephone tests and brought out a practical design of wireless telephone apparatus based on a principle which has never before been used in this sort of work.

The character of the apparatus is being kept secret, but it is stated that sets are under construction for the Italian navy, guaranteed to maintain connection between ships at fifty kilometers. It is said that messages have been sent in actual practice much farther than this.

Massachusetts Commission to Demonstrate Exchange

It happens so often that people incline to grumble over their telephone service that it has been deemed advisable by the Massachusetts Public Service Commission to give them an agency that will satisfy their want of explanation. When the subscriber lifts the receiver from the hook he wants a word from the operator right away, and if that fails to come after a moment of waiting and some clicking, the veins may begin to swell over the temple, and the violent clicking with the telephone hook becomes expressive of the agitation that is developing in the recesses of the cranium.

Just then the telephone operator may not be particularly busy, but the cause of her inattention to the efforts of the subscriber to arouse her is that no intelligence of his efforts has reached her. There may have been a break in the wire of some kind, but even if that were so, why isn't it all adjusted in a few minutes so that the subscriber finds the line open the next time he calls?

An explanation of this and almost any other imaginable difficulty that might arise between the subscriber and the company can be explained now in object lessons at the office of the Public Service Commission in Boston. A switchboard with all the equipment and the telephone instruments of imaginary subscribers have been installed in the office of William H. O'Brien, chief of the telephone division of the commission. Chief O'Brien explains its importance to the administration of his office. Under the new railroad law the telephone and telegraph companies are subject to the rules and regulations of the Public Service Commission, accountable to it for their dealings with the public, so that the commission will have a good deal to do with their service in the near future. Practically every question that is likely to arise that this commission will be called upon to deal with relates to the operation of the service and, in order that all these operations may be understood by the commissioners and the chief, or may be explained to complaining subscribers, this demonstration outfit has been installed. If a subscriber finds cause for complaint he may call at the office of the Public Service Commission and have the entire equipment set in motion for his benefit so that he may understand the nature of the defect of which he may be complaining, the reasonableness or unreasonableness of its continuance and the prospects for a remedy. He can find out how the coin boxes are operated so that the coin goes into the company's coffers if he gets his telephone connection, and how a different motion by the operator returns it to him if no connection is made. He can see at a glance just what happens when he lifts the receiver from the hook, how his wishes to communicate with somebody in the distance register before the eyes of the operator, and how ignorant the unsuspecting operator would be of his mental agitations and frantic attempts to arouse her when the wires get a little out of order. He will be shown by the samples of cables how physically impossible it would be in some instances to repair a defect in a big cable in less than a day or two; perhaps he will be willing to allow a week for the restoration of his service after seeing the conglomeration of colors and wires in the cables that carry 1,200 telephone wires, or more.

After a little study of the intricacies of the switchboard he may be endowed with a spirit of toleration; but the chances are equally good that he will be convinced of the simplicity of certain causes of complaints and will see the proper way to proceed to get satisfaction from the company. It is the first time that such a switchboard has been available for the general public for a study of the telephone service, and it is with a hope that a better understanding of the service will lead to a more efficient use of the services that the Public Service Commission authorized Chief O'Brien to install the switchboard and other object lessons. Even where the telephone company offers opportunities for such demonstrations the public does not accept them with the same readiness, and with the same confidence, as when the demonstrations are given by a public tribunal.

There are other uses to which this equipment will be put. Public hearings are likely to be called for as telephone questions arise before the Public Service Commission, and in many of these it may be of great value to the commissioners and to petitioners to have the instruments available for close inspection.

P. & A. Restored to Stockholders

The Pittsburgh & Allegheny Telephone Company was restored to its stockholders June 12, after being in the hands of receivers for more than three years, the difficulties of the company involving some $200,000 having been cleared up. Here is the new board of directors: J. M. Brown, Robert C. Dalzell, J. L. Dickey, W. C. Handlan, Richard Hawkey, Frank C. Huling, J. G. Splane, and John S. Weller. The new officers are: J. L. Dickey, president; Richard Hawkey, vice-president and general manager; F. C. Huling, treasurer; Thomas G. Davis, secretary and assistant treasurer.

Mr. Splane, one of the receivers and vice-president and general manager of the company, resigned owing to the pressure of other business interests, but it was insisted, in view of his long and active service with the company, that he consent to remain on the board as a managing director and render such advice and counsel to the new management as his time would permit.

Mr. Hawkey, the newly elected vice-president and general manager, was for some years connected with the Standard Steel Car Company at Pittsburgh, and later became assistant to the vice-president of the Eastern group of Bell telephone companies. He was also elected a director to fill the vacancy caused by the death of R. C. Hall.

F. C. Huling, the newly elected treasurer, is an attorney of Columbus, Ohio. He was also elected a director to fill the vacancy caused by the death of J. N. Vance of Wheeling, W. Va.

Telephone Installations in Manchuria

Satisfactory results were obtained from a series of experiments conducted with the wireless telegraph apparatus installed on the premises of the general postoffice, Dairen. Both dispatching and receiving instruments were manufactured at the workshops attached to the Japanese Department of Communications.

This year's appropriation for the telegraphic and telephonic installations of the general postoffice (Kwantung government) is $42,535, comprising $13,500 for an additional circuit line between Mukden and Kaiyuan, $28,624 for installing telephone connections to 380 new subscribers and $411 for creating three new automatic telephone boxes. New telephone apparatus is allotted as follows: Dairen, 130; Port Arthur, 20; Liushutun, 3; Liaoyang, 20; Mukden, 80; Hsinminfu, 10; Tiehling, 10; Kungchuling, 10; Kaiyuan, 17; Ssupingkai, 5; Changchun, 50; Antung, 25. New automatic telephone boxes will be located at Dairen, Mukden and Changchun.

Suggested Methods for Improving Service

Paper Read Before the British Institution of Electrical Engineers

BY W. AITKEN

COMPLAINTS regarding the efficiency of telephone service may be tabulated thus: (1) Failure to give service, (2) charging for service that has not been given, (3) mistakes in operating, (4) operators incorrectly reporting lines engaged, (5) premature severing of the connection, (6) general slackness on the part of the operators. The first complaint cannot be dealt with by electro-mechanical means. The second to the fifth complaints inclusive, however, contain features on which the author hopes to put forward suggestions for methods of working that will eliminate many of these troubles directly or indirectly.

There are two parties responsible for the efficiency or inefficiency of the telephone service, viz., the operators at the central exchange and the subscriber's operating staff. The operator answers a call, tests the line wanted, and if the latter is idle completes the connection. In a manually operated system these duties are fundamental. In addition, at present the operator on receiving certain signals withdraws the plugs. If, however, the position is very busy, the operator may answer one or more fresh calls before withdrawal, with the result that between the time when the calling subscriber replaced his receiver and the operator withdrew the plugs that line would test "engaged" to any other caller. Again, either line desiring a second call during that period would cause a supervisory lamp to glow, and in the case of the called subscriber this lamp is on a position where he cannot be answered. These weaknesses the author proposes to rectify by giving the equivalent of automatic disconnection, the instant removal of the engaged test when the subscribers replace their receivers, and the instant reconnection of the calling lamp to each line, so that the operator gets a definite calling signal if the receiver is replaced and then immediately removed. The subscriber's staff can also greatly interfere with the efficiency of the service by operating it incorrectly. If any line ended on one telephone the service would be ideal as far as the

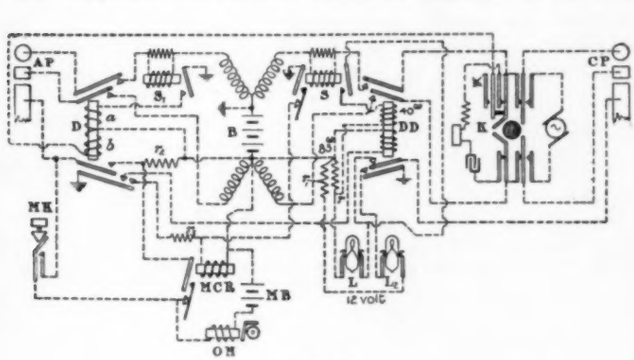


Figure 1.

subscriber was concerned, but he frequently has a switch for one extension line, or several lines on a switchboard, and with these he is given facilities for upsetting the service if he does not conform carefully to the instructions provided. The connection will probably be put through promptly, but when the ring-off signal is received from the extension line it is not acted on instantly, with the result that if the "central" operator has another call for the same subscriber, instead of getting the "main" station she gets the extension, or should the extension desire to call the main station the exchange will be called and the operator will find that she is not wanted. Obviously all these proceedings react to spoil good service. Usually the operating is left to the office boy, with the foregoing results. The devices described below will after a call cause the restoration of all apparatus to its normal condition to be automatic.

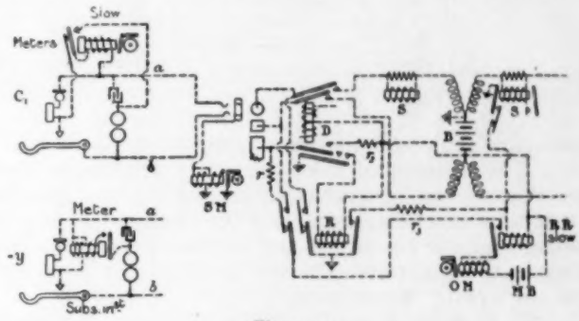


Figure 2.

AUTOMATIC DISCONNECTION ON MANUAL SWITCHBOARDS.

An invention which can speed up existing systems and make the essential and responsible operation on which the efficiency of the service most depends automatic and beyond the control of the operator is worthy of the gravest consideration. In addition to automatic disconnection each line tests idle immediately the receiver is replaced, the line lamp is instantly reconnected with its line, and the called subscriber is guarded against the caller not replacing his receiver promptly. When the connection is through two or more exchanges the advantages just mentioned are secured, and also the junction line is instantly released and made available for another connection. The carrying capacity of the junction's lines will thus be increased, and in all probability the A-operators' load can also be increased. The conversion of an existing common-battery switchboard to automatic disconnection is a comparatively simple matter, it being necessary only to alter the connecting cord circuits by fitting in place of the lamp a special relay in the local circuit of the answering cord supervisory relay, and similarly another special relay in the local circuit of the calling cord supervisory relay, also adding two extra springs to the speaking key. On the junction circuit one cut-off relay of a simple pattern is required. Various modifications will be suggested to meet different conditions.

Lamp Signals.—Preferably the lamp signals should be read in a method somewhat different from that at present adopted. Usually a lamp associated with each line glows as a clearing signal. With the author's system it is not essential to withdraw the plugs instantly, as they have been rendered electrically inoperative when the receiver is replaced, and he therefore prefers that certain lamps associated with the cords should glow during the period of connection. A supervisor will then appreciate the condition of the operator's load much more readily,

as a glowing lamp will indicate a live connection. Plugs, whether in their sockets or in multiple jacks, having non-glowing lamps in front, are available for instant further use. The glowing lamp will take less current than the shunted lamp at present used. For the same reason the junction lamp should also preferably glow during connection, the line being instantly available when the re-

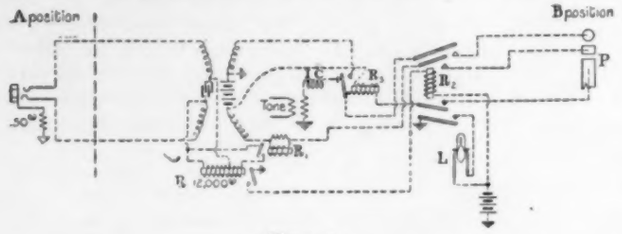


Figure 3.

ceivers are replaced, whether a plug is in a socket or a jack. The benefits of the system are felt immediately after the first cord circuit is altered, either on a junction or a subscriber's position, so that the change-over may be gradual and can be carried out without the service suffering in the slightest. The alteration of the A position is of the greater importance.

"A" Position Circuit.—When automatic disconnection is to be introduced on the system using repeater coils it will probably be found advantageous to introduce the cut-off relays in the local circuits of the supervisory relays. If the cut-off relays are made to take the place of the supervisory relays they must be similarly shunted, and might, therefore, be affected adversely by the variation of the line resistance. The local circuit method will be found the simplest and most economical method of converting an existing plant. Fig. 1 shows an "A" position cord circuit so equipped. Cut-off relay *D* is connected in the local circuit of the shunted relay *S'*, the winding of which is connected directly in the line conductor. This relay is connected exactly as in ordinary practice, but now controls the cut-off relay instead of a supervisory lamp. All conductors from the plug *A P* are open on the relay *D*. The sleeve conductor has a parallel connection to the meter key, which is also normally open. Relay *D* is double wound, one winding being in the local circuit of relay *S'* and the other in a local circuit controlled by two extra springs to be fitted on the speaking key. The calling cord relay *D D* opens all the conductors to the plug *C P* normally, and is controlled in the local circuit of relay *S*. When the present method of registering calls is retained, relay *S* is unaltered and is connected in every way as described for *S'*. In the diagram *S* is shown with a contact which momentarily earths a circuit for automatic registration and then opens the circuit again. Relay *D D* is double wound, one coil being in the local circuit of relay *S* and the other being completed by extra springs on relay *D*, so that relay *D D* is energized and controlled by *D*, and only when relay *D* permits is relay *D D* under the control of the station called for disconnection purposes. To prevent relay *D*, by the action of the calling subscriber, irregularly or unduly holding relay *D D* against the called party, the winding of *D D* controlled by relay *S* is a shunt across the supervisory lamp *L*. When, therefore relay *S* is de-energized by the called subscriber moving the switchhook, it opens the shunt circuit so that the lamp *L* glows and calls the operator's attention to the irregularity. As long as it is energized relay *D D* also completes a circuit of the lamp L_2. It will be noted that the transmission circuit, the line circuits, and the multiple are absolutely unaltered.

Operating.—When the operator answers a call by inserting the plug *A P* in the jack of the line calling, and presses over her listening key *K* to join up her telephone, relay *D* is energized, as a local circuit is completed from ground at the key *K* through extra springs, through winding *b* of relay *D* to the battery. All conductors are then joined through to the calling line and relay *S* is energized. This completes another circuit through the *a* winding of relay *D* so that it remains energized after the key *K* is removed to another position and opens the *b* circuit. Current through r_2 engages the calling line. Relay *D* being energized also completes a circuit from earth at the lower contact of *D* through the lower winding of *D D* to the battery, so that *D D* is also energized and the lamp L_2 glows. The operator tests the line wanted in the well-known manner, and if idle inserts the plug *C P*. Ringing is done in the customary way. The supervisory lamp *L* then glows and continues to glow until the called subscriber answers. When the subscriber answers, relay *S* is energized and completes the shunt circuit of the lamp *L* so that it ceases to glow. This coil is also the retaining circuit of relay *D D*. The connection is now established. Should the calling subscriber replace the receiver, relay *S'* will be de-energized and open the circuit of relay *D*. *D* will become de-energized and open all the conductors to the plug *C P* and the circuit of the energizing winding of relay *D D*. The calling line will immediately test idle and the line relay and calling lamp will be re-associated with it, so that another call can be sent in on the line lamp. Relay *D D* will remain energized until the called subscriber hangs up his receiver, when relay *S* will be de-energized and open the circuit of relay *D D* so that all conductors to the plug *C P* are opened, and the called line will now test idle and the line lamp be re-associated with the line. The lamp L_2 will cease to glow, and the operator will know that the plugs are available for another call. Should the called subscriber be the first to replace the receiver, relay *S* will become de-energized and open the upper or shunt winding of relay *D D* so that the lamp *L* glows, but relay *D D* will remain energized by the circuit through the contact on relay *D*. If this lamp glows for an appreciable time the operator would challenge the calling circuit. It will be readily appreciated that the plugs being rendered electrically inoperative it is not essential to withdraw them

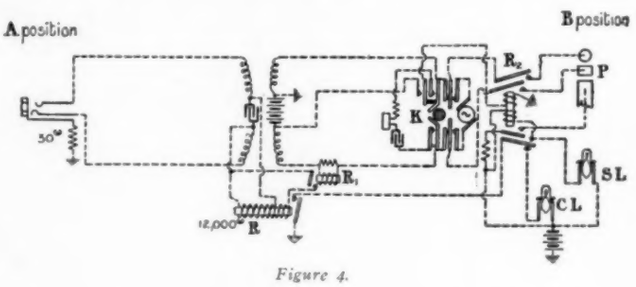


Figure 4.

instantly, and they may be withdrawn at the convenience of the operator, or they may even remain in the jacks until required again for another connection. For the same reason the negative clearing signal will be no disadvantage, as the connection is automatically disconnected by the subscriber, and it is believed that the lamps glowing during connection will be a valuable feature in con-

tinuously advising the supervisors of the condition of the operator's load.

REGISTERING TELEPHONE CALLS.

Manually Operated.—The calls may be registered in the well-known manner by pressing a meter key, and in the modified arrangement this key may be pressed either during the connection or at the termination of the connection before the plugs are withdrawn. The answering plug third conductor is connected in parallel with a spring of relay *D* and a spring of the meter key, both being insulated normally. If registering is done during the conversation the operator's meter and extra battery are in parallel with the resistance *r* (about 200 ohms), but if after, there is no resistance, as the circuit is open at the springs of relay *D*.

Automatic Registration: Meters in Exchange.—The automatic disconnection system lends itself readily to automatic registration in a simple manner, particularly if the meters are retained in the exchange as at present. The existing circuit with the meter in parallel with the cut-off relay remains unaltered. One additional relay, *M C R* (Fig. 1), is required, and may be called the meter control relay. This has springs so arranged that it gives a momentary contact when energized. An extra spring is added to the cut-off relay *D* to complete a circuit for relay *M C R*. The resistance r_3 in series prevents relay *M C R* pulling up when relay *D* is first energized. When the resistance r_3 is momentarily short-circuited, relay *M C R* is energized, and is then retained energized by the circuit through relay *D*. The supervisory relay *S* has springs so arranged that when energized a momentary ground is put on relay *M C R* as before mentioned. As relay *M C R* is then locked in a local circuit, further operation of relay *S* will not affect the circuit again.

Operation.—When the calling subscriber is answered and relay *D* becomes energized, a circuit is completed from ground through the contact of relay *D*, resistance r_3, winding *M C R*, to the battery. Resistance r_3, however, does not pass sufficient current to energize relay *M C R*.

When the called subscriber answers by lifting the receiver, relay *S* is energized and momentarily shunts the resistance r_3, and relay *M C R* is energized and remains energized because the current through it is sufficient for that purpose. Relay *M C R* on becoming energized momentarily completes a circuit from the main battery *B*, through the meter battery *M B*, the operator's meter *O M*, the contact of relay *M C R*, the contact of relay *D*, to the third conductor of the plug *A P* and the jack of the calling line, through the meter to ground, so that both meters register one call. Relay *M C R* is not de-energized until relay *D* has opened its contacts, so that it is impossible for relay *M C R* to send another impulse on becoming de-energized when the springs again momentarily make an earth connection. If thought desirable a key *M K* may be fitted so that the operator can send an additional impulse when the call is of greater value than one impulse.

Meters at Sub-stations.—When the meters are to be fitted at the subscribers' offices, two meter control relays are necessary for each cord circuit (Fig. 2). Relays *D* and *S* are altered as before described. Relay *R* (Fig. 2) has two normally insulated contacts, connected one to each line at the plug side of relay *D*. Relay *R* is in a local circuit completed through a contact on relay *D*, so that relay *R* is energized immediately after relay *D*. Momentary contacts are then made with the lines, but, as relay *R R* is not energized, the battery is not connected. Relay *R* completes a circuit for relay *R R* through resistance r_3, which does not allow sufficient current to pass to energize it. Relay R R is made to de-energize slowly. The momentary contact on relay *S* energizes relay *R R* by short-circuiting the resistance r_3. Relay *R R* is then held energized, while the local circuit is completed through a contact on relay *R*. At the substation the

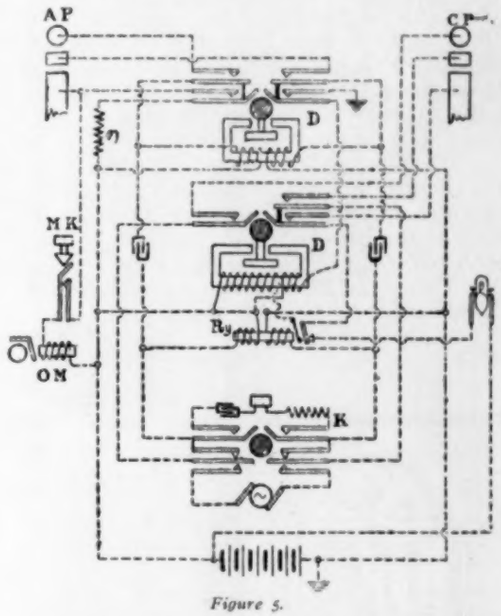


Figure 5.

meter, which is made to de-energize slowly, is fitted normally in parallel with the speaking set. It may remain in parallel or be cut out of this circuit. When the relay part of the meter is energized in this circuit a second or registering circuit is completed in parallel with the condenser, which is normally in series with the bell. The operation is as follows: When a subscriber makes a call a circuit is completed through the relay winding of the meter in parallel with the speaking set, so that it operates to connect the registering circuit across the condenser and in series with the bell. The operator answers and connects relay *D* in circuit, and relay *R* is energized and causes momentary contacts to be made with the lines, but completes no circuits. Connection is made with the subscriber called, and, when he answers, relay *S* is energized and momentarily shunts resistance r_3, so that relay *R R* is energized and is retained energized by the circuit through relay *R* contact. Relay *R R* completes no circuit when energized, as the circuit is open at relay *R*. At the termination of the conversation, when the calling subscriber replaces his receiver, relay *D* is de-energized and opens the circuit of *R*. As relay *R* becomes de-energized its springs make momentary contacts, which complete a circuit from the batteries *B* and *M B* through the operator's meter *O M*, the contact of relay *R R*, the outer contact of relay *R*, to the ring of plug *A P*, over line *b*, through the bell and meter to wire *a*, the tip of plug *A P*, to the other contact of relay *R*, to ground. The substation meter registers and then falls away, so that the condenser is in series to prevent current flowing normally. The meter is de-energized slowly so as to allow of the impulse being received. The relay *R R* is made to operate slowly so that it will not become de-energized until the impulse has been sent by relay *R*.

Meters at Sub-station and Exchange.—The existing meter arrangement may be retained at the exchange, and a connection made to the back contact of relay *R*, which is normally open at relay *R R*, so that an impulse may also be sent through the exchange meter when the calling subscriber replaces his receiver.

JUNCTION WORKING.

Order-Wire Junction.—Fig. 3 is a diagram of a junction circuit in its simplest form showing only the features in connection with automatic disconnection. The special feature is the introduction of the cut-off relay R_2 on which the three conductors of the plug *P* are normally insulated. The four-wound repeater has the two windings on the line side connected through a condenser, which is shunted by the 12,000-ohm winding of a relay *R*. The repeater windings to the plug have the inner ends connected to the battery. One conductor to the plug has a supervisory relay *R'* in series (with a non-inductive shunt). This relay *R'*, when energized, connects a low-

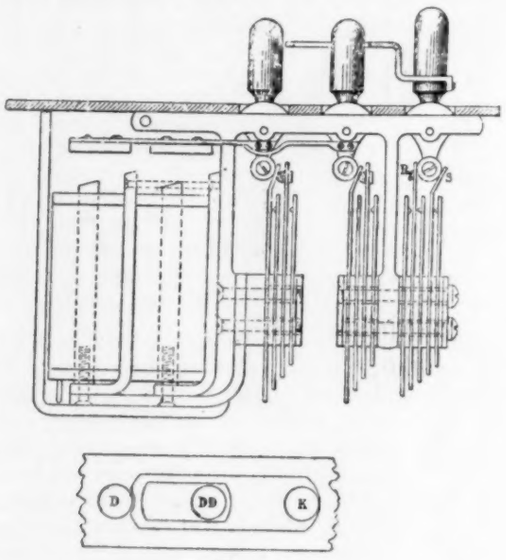


Figure 6.

resistance winding across the 12,000-ohm winding of relay *R*. Relay *R* completes the circuit of the cut-off relay R_2, so that it connects all the conductors through (with the exception of a break in the tip conductor). The back contact of the third conductor relay R_3 connects the operator's testing winding *I C* through a contact on the cut-off relay to the tip of the plug *P*, so that when the operator tests the line she may get a click in her receiver if it is engaged. The A operator must take up the line instantly it is allotted to her, so as to energize the disconnect relay and join up the B operator's testing circuit. To enable the B operator to know that this has been done and that the test will be effective, a tone test device is connected in the circuit of the testing winding of her speaking set, by which she will get a low hum when she tests, if the cut-off relay is energized, on which the ordinary test will be superimposed. It is suggested that in a primary circuit of a coil and battery a suitable and distinctive tone would be received from a microphone, against the diaghragm of which a jet of air impinged. The cut-off relay also completes the circuit of a lamp, which glows until the cut-off relay is de-energized at the termination of a conversation.

Operating.—When an A operator receives a call for a line in another exchange she asks for that number over a suitable order wire, and the B operator allots a junction to be used. The A operator has lifted the plug, such as *C P* in Fig. 1, and is waiting with her plug over the block of jacks appertaining to the exchange in question, so that she plugs in instantly. The 12,000-ohm relay *R* is then energized, and it in turn energizes the cut-off relay R_2. Relay R_2 joins the conductors to plug *P* with the exception of the tip conductor, which remains open for testing purposes. The B operator then tests the line wanted in the well-known manner, and knows by the faint hum received from the tone test device in series with the tertiary winding of her telephone set whether the line is engaged or not, and that the test has been effective. The plug is inserted in the jack if the line is idle, and ringing is done in any of the well-known ways. When the subscriber answers, the B operator's supervisory relay R_1 is energized, and this by putting a low winding in parallel with the high-resistance winding of relay *R*, actuates the A position supervisory rely *S* so that the lamp *L* ceases to glow. When the junction plug was inserted, the sleeve relay R_3 was energized and cut off the operator's testing coal *I C*. The B position lamp *L* glows during connection and until automatic disconnection takes place. When the subscriber replaces the receiver after conversation the supervisory relay R_1 at the B position is de-energized, and the low-resistance shunt on relay *R* is removed, so that the A position supervisory relay *S* is de-energized, and allows the supervisory lamp *L* to glow if the calling line receiver has not been replaced. If the calling line receiver has been replaced the cut-off relay *D D* will also be de-energized, and will open all the conductors to the plug *C P*, so that relay *R* is de-energized. This relay opens the circuit of the B position cut-off relay R_2, and in de-energizing it opens all the conductors to the plug *P*, thus rendering it electrically inoperative. The called line now tests idle, and its line lamp is re-associated with the line in readiness for another call. When relay R_3 becomes de-energized it connects up the operator's testing circuit at that relay, but it is opened at a contact of the cut-off relay. The lamp *L* (Fig. 2) ceases to glow and the plug *P* may be withdrawn. Any junction may be alloted for another call whether the plug is in its socket or in a jack—if the lamp is not glowing. The junction is thus rendered available for immediate further use when the subscriber replaces his receiver. Although a plug remains in the outgoing jack at the one end, and the junction plug may be in a multiple jack at the other end, they have both been rendered electrically inoperative by having all their conductors opened. The operators will withdraw the plugs as quickly as possible, but they may delay this until it can be done without interfering with the efficiency of the service.

Automatic Calling on Junctions.—When no order wire is used the insertion of a plug at the outgoing end automatically lights a lamp at the B position as a calling signal. Such a circuit is shown in Fig. 4. The repeater, with its windings connected to the condenser and the battery, is exactly the same as on order-wire junctions, as is also the 12,000-ohm relay *R* and the supervisory relay R_1 at the B position. The relay R_1 does not directly control the cut-off relay R_2. All conductors to the plug *P* are normally insulated at relay R_2. The cut-off relay R_2 is double wound, one winding being completed in a circuit with the battery through an extra contact on the speaking key, which is closed when the operator presses over the lever to answer a call. The second winding has one side connected to the battery and the other to an inner contact

of the cut-off relay, the associated moving spring being connected to the contact of relay R, the outer contact of the same moving spring being connected to the calling lamp and battery. When the operator puts over the key to answer, relay R_2 is energized and cuts off the calling lamp $C\ L$. A retaining circuit is then completed from ground at relay R, through the moving spring and the inner contact and winding of R_2 to the battery, so that when the operator cuts off her telephone the cut-off relay R_2 will now be controlled by relay R. A supervisory lamp $S\ L$ is connected in parallel with the retaining coil of the cut-off relay, so that it glows as long as this relay is energized. The speaking and ringing key K is connected between the contacts of the cut-off relay and the repeater.

Operating.—When the A operator has a call for a line in another exchange she tests in the well-known manner for an idle line, unless a visual test or other device is provided to indicate what lines are engaged. When the plug, such as $C\ P$ (Fig. 1) is inserted, the 12,000-relay R is energized, and a local circuit for the calling lamp $C\ L$ is completed. The B operator pushes over the speaking-key lever to her telephone, and a local circuit is also completed through one winding of the cut-off relay R_2, so that it is energized to cut off the calling lamp $C\ L$ and complete the retaining circuit previously mentioned. It also completes the circuit of all conductors through to the plug P. The supervisory lamp $S\ L$ also glows. The operator tests and rings in the usual manner. When the called subscriber answers the supervisory relay R_1 is energized and shunts the 12,000-ohm winding, so that the supervisory relay S (Fig. 1) at the A position shunts and puts out the associated lamp L, and the holding circuit of the cut-off relay $D\ D$ at that position is completed. When the called subscriber hangs up his receiver after a conversation, the B-position supervisory relay R_1 is energized, and the shunt removed from relay R, so that if the calling subscriber has replaced his receiver the A-position supervisory relay S and the cut-off relay $D\ D$ are de-energized. All the conductors to the A-position plug $C\ P$ are, therefore opened, and the B-position relay R is de-energized. This opens the retaining circuit of the cut-off relay R_2, so that it is de-energized and opens all the conductors to the plug P, allowing the line relay and lamp to be re-associated with the called line and the line to test idle. The supervisory lamp $S\ L$ ceases to glow and the calling lamp $C\ L$ is re-associated with the junction line. The junction line has thus been automatically disconnected at both ends instantly and is available for another call although the plugs have not been withdrawn. The onus of determining disconnection is on the calling subscriber, and should he fail to hang up his receiver the called subscriber calls the operator's attention to the irregularity when he hangs up his receiver by causing the supervisory lamp to glow. The caller, immediately he hangs up his receiver, re-associates his calling relay and lamp with his line and causes it to test idle, but does not release the called line. The called subscriber must replace his receiver to release his line and also the junction line. It is believed that the fact of the supervisory lamps glowing during conversation will be a very valuable feature from the point of view of supervision, particularly in enabling a traffic supervisor to note at any period of the day the load of the position and the load of the junction lines. It is reasonable to expect also that the carrying capacity of the junctions will be increased, as they cannot be delayed by slow releasing of the lines.

JUNCTION WORKING WITH THE B POSITIONS UNALTERED.

In certain circumstances it may not be considered advisable to alter the incoming ends of the junction lines on the B positions. This, at any rate, might be delayed without sacrificing a very great deal of the efficiency of the system. When two lines are joined together locally, *i. e.*, in the same exchange, the full advantage would be obtained if the board were of the complete multiple type. If, however, it were worked on the transfer system, and in the case of connections through another exchange, all the advantages would be obtained with the exception of the automatic disconnection at the B position and the consequent instant release of the called subscriber's line. His line would test "busy" and the line lamp would not be re-associated with the line until the operator withdrew the plug as at present. Owing to the high efficiency of the operating at these positions this might not amount to a great deal, and might not be noticed in service tests. The junction would be automatically released when both subscribers replaced their receivers, and the clearing signal would be instantly given to the B operator. That operator

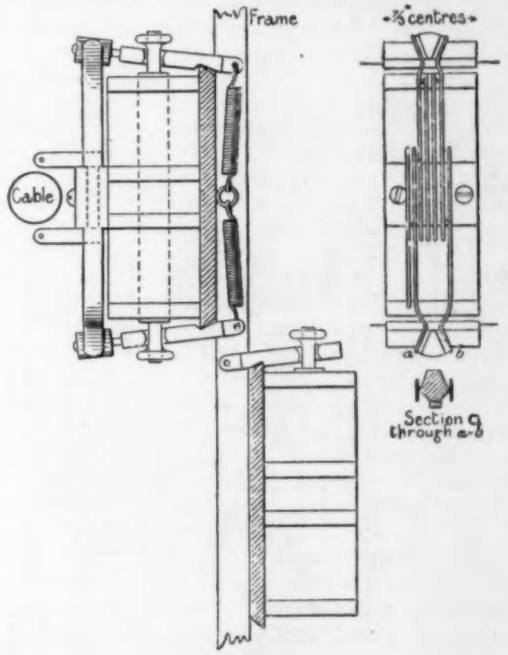


Figure 7.

by the lamps glowing would know what lines were idle although she had not had time to remove the plugs and could again bring the lines into use by removing the plug from one part of the multiple to another. The private branch exchange lines at each end of the circuit would both be instantly automatically disconnected, all the lines would be opened at the A position, and the clearing signal would be given at the B position. When the connection was through two exchanges the loss would be somewhat greater, as the clearing in the second exchange would depend on the withdrawal of the plug at the first exchange.

SYSTEM USING DISCONNECTING KEYS.

For small multiple switchboards for public service, or as branch exchanges in subscribers' offices, the author prefers to use keys to take the place of the relays formerly described. Fig. 6 shows a combined speaking, ringing, and two disconnecting keys mounted on a common frame, the two latter keys being electromagnetically controlled. This arrangement is very compact. The "Stone" system of transmission is best adapted for use with electromagnetic keys, as it is not then necessary to shunt

them, preferably used with a 40-volt main battery. The circuit is shown in Fig. 5. When the operator presses over the speaking-key lever to join up her telephone it engages with the two levers of the cut-off keys and forces them over also. The coils of the keys are joined to the conductors by the springs, the inner ends of the coil D being connected to the battery. As the caller's microphone is then in circuit current flows through the coil of the answering-cord key so that it is retained after the speaking key is moved to another position. The springs of this key also complete a circuit of one winding of the key in the calling circuit, so that it also is retained and connects the conductors through to the calling plug. A double-wound relay is connected across the loop with the inner ends connected to the battery, and current is supplied through this to the called subscriber's microphone. The supervisory lamp circuit is completed by the back contact, and the holding circuit of the cut-off key by the front contact. The former enables the called subscriber to signal the operator should the caller fail to replace the receiver promptly after conversation. When the caller

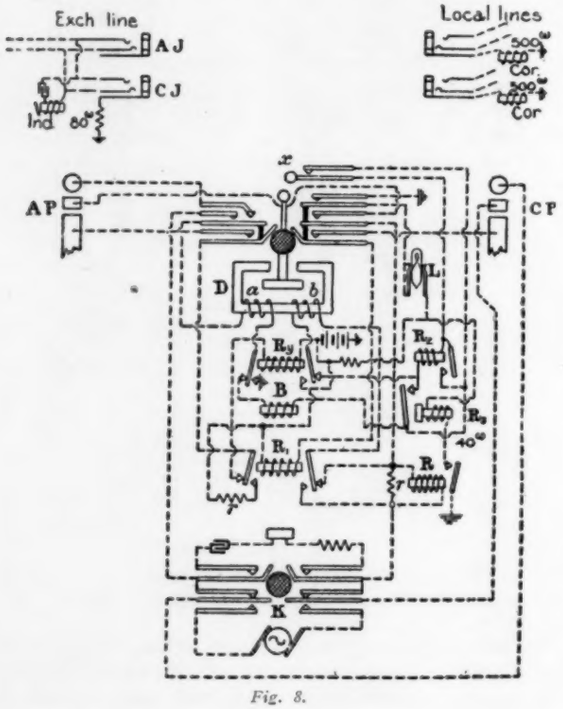


Fig. 8.

this type of installation of the non-multiple kind in subscribers' offices. It is essential, however, in order to obtain all the advantages described, to use line and cut-off relays instead of a line relay with a break jack, as is usual. With a view of reducing the cost and saving space, combined or twin relays should be used. These are common in automatic practice, but have not hitherto been used in manual systems. A common core is used with a central ring, which with the armatures and magnetic returns complete two independent magnetic circuits. Fig. 7 shows a suitable design. The cord circuit is illustrated in Fig. 8. The keys are shown separated in order to simplify the diagram. The electromagnetic key D takes the place of the answering cord supervisory signal and the bridging coil through which current is fed. There are no condensers in the conductors, and the double winding of the replaces his receiver the cut-off key D is de-energized and opens the conductors, so that his line tests idle, and a second call can be sent in instantly. The energizing coil of the calling cord key is also opened, but it is still held operated by current over the line, maintaining relay R_y energized, and only when the called subscribed restores his receiver does relay R_y and key D' become de-energized and open all conductors to the plug $C\ P$ so that his line tests "idle" and his line lamp becomes re-associated with his line. As the circuit is opened when the caller's receiver is replaced, and cannot be re-established without the intervention of the operator, the answering cord should then be reckoned as "idle," but the operator must wait until the second lever returns to normal before withdrawing the calling plug to avoid re-associating the called subscriber's calling lamp with the line until the receiver is replaced.

PRIVATE BRANCH EXCHANGES.

Automatic disconnection is particularly applicable to cut-off key is connected across the loop when the key is operated, with the inner ends connected to the relay R_y contacts. When relay R_y is not energized another coil B is in series with the windings to complete the circuit, but when the relay is energized the windings are connected to a local battery or feeder mains to supply current for a local connection. The supervisory signal is replaced by a relay R, which shunts the lamp L and also controls the slow-acting relay R_3 so that the local line connected to the answering or calling cord can disconnect the circuits. Relay R_3 is a retaining relay which is energized when the bridge is completed across the loop by the lever being pressed over and the momentary contact x completed. Relay R_2 thus keeps the circuit completed when the operator moves the key K to the ringing position, until the called subscriber answers. Relay R_3 then short-circuits R_2 so that it is de-energized, and thereby relay R controls the connection and opens the circuit at the determination of the conversation. Relay R_3 is slow to release to allow R to pulsate the lamp L when the switchhook is moved to call the operator. This allows calls to be transferred from one station to another. The line circuits on the jacks are somewhat modified. Each exchange line has two jacks, the upper or answering jack having the sleeve insulated, while the lower or calling jack has the sleeve connected through an 80-ohm resistance to ground. The line indicator with a condenser in series is permanently connected across the exchange line. The cut-off relay coils on the local lines are of high resistance—say 500 ohms. In the cord circuit the calling plug has the third conductor connected through a low-resistance relay R' to the battery and earth. When energized, this relay by one set of contacts opens the circuit of relay R_y and connects the sleeve of the plug $A\ P$ through the resistance r to the battery and earth, so that the cut-off relay of the extension line may be energized. Relay R_1 by another set of contacts switches the battery through one winding of the coil of the cut-off key D from one side of the supervisory relay R to the other, so that relay R is always associated with the local line. When a call is received from the exchange the plug $A\ P$ is inserted in the upper jack AJ, and, as the sleeve of that jack is insulated, relay R_y is not energized when the levers of keys K and D are pressed over. A circuit is then completed from the main exchange battery through the cut-off key winding $D\ D$ in the calling cord there, over the line circuit, through the windings of key D at the private branch exchange, through coil B, and the winding of relay R_2, the circuit having been momentarily closed

by the contact x of key D which caused relay R_2 to be energized and be retained. The holding circuit of D D is thus completed at the main exchange, and the supervisory lamp shunted out, and at the private branch exchange the cut-off key D and relay R_2 are energized, and they remain in that condition after the key K is moved to the ringing position. When the plug CP is inserted in the jack of the line wanted the cut-off relay is energized, but the relay R_1 is biased against this current. When the called subscriber answers, a circuit is completed through relay R, which shunts out the lamp L by the 40-ohm winding of relay R_3 that is also energized, and it short-circuits the winding of R_2 so that it is de-energized, and relay R_3 completes the circuit for the bridge across the loop. When the called subscriber replaces the receiver, relay R, through relay R_3 opens the bridge circuit so that key D is restored to its normal position, indicating to the private branch exchange operator that the cords are available for further use. Key D in turn opens the line circuits and de-energizes the key DD at the central exchange. The exchange line has thus been instantly cleared at both ends and made available for another connection in either direction. When a call originates with a private branch exchange line the plug AP is used for answering, and the key is thrown over, a circuit then being completed through relay R_y and the cut-off relay COR. Relay R_y connects the battery between the two windings of the key D so that the caller can talk to the operator. If connection is wanted with the exchange the plug CP is inserted in the lower or calling jack CJ. A circuit is then completed through the 80-ohm spool on the jack sleeve, through relay R_1, and the latter relay cuts the circuit of R_y so that it is de-energized and replaces the local battery by the coil B, as current for the microphone on an exchange connection is to be fed from the central battery. Relay R_1 also connects the winding of the coil D to the plug CP side of relay R, so that the latter is associated with the circuit of plug AP. The exchange is called automatically, as the coil B completes the loop circuit. The springs of relay R_y should be so adjusted that they make contact before breaking, so that the key D may not release. Relay R_2 will energize, and will in turn be cut out of circuit when the relay R_3 is energized. The calling line cut-off relay will be kept in operation by current through the resistance r. At the central exchange the answering cord key D will be maintained energized over the caller's line and microphone. When the caller's receiver is replaced relay R will be de-energized, and by relay R_3 open the circuit of coils B and D, so that the key D' at the central exchange and the key D at the private branch exchange will be simultaneously de-energized, and the line will be instantly cleared at both ends. Should a local connection be contemplated the plug AP will be inserted in the caller's jack and relay R_y will be energized, so that current will be provided for the calling line; and when the plug CP is inserted in the calling line jack, relay R_1 will not be energized, so that current will be available to energize both microphones. In such a case the circuit will be automatically disconnected only when the receivers at both stations are replaced. It is thought that a single cut-off key will not be objectionable on these small boards, because there would always be a plug over a lamp which might glow if the called subscriber kept his receiver in his hand after the caller had replaced his receiver. Suitable circuits are also provided for giving automatic disconnection on extension line switches and on cordless switchboards.

Telephone a Factor in Farm Sales

A farmer's telephone is about as much a real part of the farm equipment nowadays as a horse or a spade. The only difference is that the telephone has not been used as much as the other implements. We all know of the invaluable aid rendered by the telephone in case of sickness in family, or stock or breaks in farm machinery. But there is another quite undeveloped use of the telephone and that is its importance in helping to sell farm products.

Ten or fifteen years ago it was the custom for the farmer to load his eggs, butter, poultry, apples and potatoes into the wagon and travel to town with them. Upon arriving at the village store, the deal was made with the merchant and all seemed well. It was all well—for the merchant. He knew what other towns were paying for produce, because towns were connected by the telephone long before the rural districts had them. His daily paper placed him in touch with outside markets. So the price he paid depended upon how badly the farmer wanted to sell and how little he would have to pay in order to get the goods wanted.

Now, a wise farmer calls the dealer before the apples are picked from the trees or the poultry caught, or the potatoes dug. He not only calls one but all the best dealers, so that prices can be compared. Even then if he suspects that he is being bested, it's a small toll to talk to the larger nearby city and find out what are the real market conditions.

One can save the price of the whole year's telephone bill each week during the harvest. It is possible for one to sell the entire next day's pick without leaving the house. Formerly it was necessary to make an extra drive of ten miles each afternoon or evening to sell the fruit for the following morning's delivery. Even under those conditions, the plan of making this selling trip, after the fruit was gathered and yet undelivered, was a paying one. Now doing the same job without leaving the place at all, shows even more plainly the necessity and desirability of having a telephone.

Nearly every week in delivering stuff in the local market, there are evidences of folly and waste, where farmers are trying to sell things without previous arrangements with the dealer. A man brings in five bushels fairly good apples. He doesn't want to take them home again and the grocer to whom he offers them knows that as well as he does. So the shrewd buyer remarks that the market is full; there are plenty of apples to be bought, and if the usual price is a dollar, he will possibly say he'll give $3.00 for the bunch, provided he will include the sacks. The farmer, not knowing the actual conditions, will leave the five bushels and go his way. This is not imagination. It is everyday occurrence.

In many towns there are grocers who buy a large part of their berries and vegetables from people who are forced to sell just as this man did. And these merchants make money. It is rather hard to arrange with them over the telephone, because when we have a good article, carefully packed, they can not afford to pay the price when they are very sure there will be somebody along with a slightly poorer grade, less carefully packed, and probably satisfied with half the price.

Do not try to deliver anything before you find out whether there's a market and what the market is paying for what you've got. This telephone work, with careful handling of the product, will tend to create a market for you. When the grocer is hard pressed for some article, he will call for your stuff at your own price.

The Law and the Telephone

How Telephone and Other Public Utility Matters Are Treated in the Courts

BY E. J. WENNER*

REGULATION OF TELEPHONE COMPANY BY COMMISSION—REVIEW BY COURTS

ACT No. 138 of the Public Acts of 1911 of the State of Michigan, provides that the Michigan Railroad Commission shall decide certain controversies between telephone companies and their subscribers and other public service corporations and their customers.

The Cass County Home Telephone Company does business in Cass and Van Buren counties in Michigan with an exchange at the village of Cassopolis. Certain users of the telephone were considered as subscribers and others considered as non-subscribers. Rules and regulations requiring certain advance payments, etc., were adopted as being in force January 1, 1912. On the 30th of the month the telephone of one of the subscribers was disconnected and his service discontinued. In March of 1912, he made complaint to the Michigan Railroad Commission charging that the company discriminated in refusing to give him telephone exchange service, and asked the commission to declare as unreasonable certain regulations contained in his contract which they required the subscribers to sign if they desired a renewal of their service. The decision of the commission rendered in June of 1912 was unfavorable to the subscriber and he took the matter to the circuit court. On January 8, 1913, the court made an order requiring, among other things, that service be restored to certain patrons of the company who had been deprived of it. The order further provided that same was only temporary in character and was to preserve the rights of the parties without prejudice until such time as the railroad commission should have passed upon the matters and things complained of in another proceeding started by other subscribers against the Cass County Telephone Company.

Immediately after the entering of the order a certified copy was served upon the young lady in charge of the Cassopolis exchange, and on the then acting general manager of the telephone company. The company immediately filed a claim of appeal from the order and had notice of same served upon attorneys for complainant.

The officers of the telephone company refused to abide by the orders of the court and complainants filed a petition and had notice served upon the officers of the company requiring that they appear before the court on January 17, 1913, and show cause why each of them should not be adjudged guilty of contempt and be fined and punished for failure and refusal to comply with the terms, conditions and requirements of the court order. A hearing was had and the various defendants were found guilty and each fined $100.00. They appealed to the Supreme Court of Michigan, claiming that the circuit court had no jurisdiction and authority to entertain the contempt proceeding, and that the fine imposed was unjust, unreasonable, and that the finding of the court was void for want of jurisdiction.

In its opinion the supreme court stated that the jurisdiction of the circuit court over matters of this kind was strictly statutory, and it was, in such a hearing, not exercising its general equity jurisdiction. Section 12 of Act No. 138 of the Public Acts of 1911 gives the complainant a right to commence an action in the circuit court in chancery against the commission, as defendant, to vacate and set aside such order as unreasonable. "Clearly, there is no general equitable jurisdiction in the circuit court, in chancery, to declare an order of a commission or body unreasonable. The entire proceeding in the circuit court in chancery was statutory, and the court was not acting in the exercise of its general equitable jurisdiction."

Section 13 of the act provides that no injunction shall issue suspending or staying the order of the commission, except upon application to the court or to the judge thereof, notice to the commission having been had. It is claimed by the defendant that the order of the court was in the nature of an injunction and that, if legal, had the same effect. No notice of injunction was served upon the commission, therefore the court had no jurisdiction to make the order complained of.

For the reasons above the judgment of the circuit court was reversed and the defendants discharged at their costs.

Briggs et al. v. Cass Circuit Judge (Michigan), 144 *Northwestern Reporter,* 501.

LIABILITY FOR RENTAL—RETROACTIVE STATUTES—FRANCHISE

The people of the state of Michigan adopted a constitution which became the fundamental law of the state on January 1, 1909. This constitution provided that telephone companies should, before constructing lines over the public highway within the state, first obtain a franchise from the municipality through which same was to be constructed. Prior to January 1, 1909, such companies had the right to occupy public highways within the state without the franchise above mentioned, subject, however, to the right of the muncipality to impose reasonable rules and regulations governing the erection and maintenance of poles and wires.

On April 2, 1909, Union Telephone Company made a contract with one Ingersoll to install and maintain a telephone in defendant's residence in Greenbush township for a period of five years at an annual rental of $20.00, Etc. The telephone was installed in the fall of that year, at a time when a new line was constructed, and considerable money was expended for poles and wires to build to the residence of defendant.

In January of 1912, the plaintiff company reduced its rates to rural subscribers to $15.00 per year. When the new schedule was adopted the company offered to enter into a new contract with the defendant, in lieu of his existing contract, and to terminate at the same time, but at the rate of $17.00 per year. The defendant refused and told the district manager that the existing contract "was good enough" for him.

A few days later the defendant notified the district manager to remove the telephone from his residence on April 1. No attention was paid to the notice, and on April 27 the defendant in writing notified the district manager that the telephone had not been removed as ordered, and that he was through paying for it and would not use it after that day.

Plaintiff did not remove the instrument but main-

*M. L.—Member Waterloo, Iowa, bar.

tained it and afforded the defendant proper opportunity to make use of it according to the terms and conditions of the contract.

An additional quarter's rental was due on July 1, and after same was not paid, plaintiff brought action in the court of a justice of the peace to recover the $5.00 rental for the quarter. Judgment was obtained in the court below and a writ of error was taken to the circuit court of Clinton county. From an affirmance in that court the defendant appealed to the supreme court, claiming error and alleging that the plaintiff had no right to bring action against him because the constitution required that a franchise be secured, whereas the company built its line without securing one.

The supreme court held that such a defense could not be raised by the defendant, but could only be interposed by the state or one of its agents. The court stated that at the time the contract was executed the defendant knew the law, or at least was charged with knowing it, and he allowed the plaintiff to install the telephone at a considerable expense, and he enjoyed the benefits of the telephone until such time as the reduction was made in the rental charged rural subscribers. It stated emphatically that the violation of the law on the part of the plaintiff might afford a reason for the forfeiture of its charter at the instance of the government, but it does not invalidate the contract.

The judgment was affirmed.

Union Telephone Company vs. Ingersoll (Michigan), 144 *Northwestern Reporter,* 560.

INSTALLATION OF TELEPHONE—BREACH OF CONTRACT—WANT OF MUTUALITY.

The Great Northern Railway Company brought action against the Sheyenne Telephone Company to restrain it from removing its telephones from the depots at McVille, Pekin, Tolna and Warwick, North Dakota. The telephone company maintains an exchange in each of the four towns and has been affording telephone service to the depots. In 1909, it made a contract to supply service in the depots at McVille and Pekin, and in October, 1907, it made a contract to supply service at Tolna and Warwick. In each of these places the service was given without charge to the railway company. The McVille and Pekin contracts stipulate that the agreement shall continue in effect for a term of five years and thereafter until thirty days' notice shall be given by either party to the other. They expire in 1914 if terminated by notice. The Tolna and Warwick contracts stipulated that the telephone should remain until such time as the railroad company gave thirty days' written notice of its desire to cancel. The contracts stipulate against cancellation by the telephone company. Chapter 252 of the North Dakota session laws of 1911 requires railway companies to install and maintain telephone service in their depots for the benefit of their patrons at all stations where telephone exchanges are maintained.

After the adoption of the above mentioned law the Sheyenne Telephone Company served notice upon the railway company that it would remove its telephone from the depots unless the railway company paid it for the service the same amount as charged to other patrons. The railway company refused to pay rental and the telephone company threatened to remove its instruments, whereupon the injunction as above mentioned was instituted. The court held that the McVille and Pekin contracts were mutual and equitable and supported by a consideration, and that under them the telephones should remain in the depots until such time as one party gave notice to the other, after the expiration of the five years, that the contract should be cancelled. As to the Tolna and Warwick telephones the court held that that contract was inequitable and lacked mutuality. The holding is that the telephone company may remove the instruments from the Warwick and Tolna stations, and that the railway company is obliged to pay rental for the use of the instruments from the time the notice of cancellation of contract was served upon it.

Great Northern Railway Company v. Sheyenne Telephone Company (North Dakota), 145 *Northwestern Reporter,* 1062.

DAMAGES OCCASIONED BY THE NON-DELIVERY OF MESSAGE—MEASURE OF DAMAGES—COMPETENCY OF WITNESSES—OPINION EVIDENCE AS TO VALUE.

The plaintiff, Hanson, a resident of Dunlap, Iowa, being desirous of purchasing cattle in the neighborhood of Streeter, North Dakota, for the purpose of shipment to Iowa, corresponded with his son, who resided in Streeter. On March 1, 1911, he received a letter from his son saying he had seen a party who owned sixty head of steers at an average weight of 700 pounds and that the owner would accept $4.25 per cwt. if the offer was accepted immediately by wire. The plaintiff immediately, and on March 1, telegraphed his son that he would leave on the first train and asked him to hold the cattle until he could arrive there, stating also that if he could not hold the cattle to buy them at $4.25 per cwt. or less. The telegram was not delivered at Streeter until the afternoon of March 4.

Immediately after sending the telegram the plaintiff boarded a train for North Dakota and arrived there about nine o'clock p. m. on March 3, and before the arrival of the telegram. On the morning of March 4, plaintiff and his son went to the owner of the cattle for the purpose of buying them. They were informed that he had already sold a part of them on the day previous, and that on account of an advance in price he wanted $4.70 for the balance. Efforts were made to purchase an equal number of cattle. Plaintiff was unable to buy any at less than $4.70 per cwt., and did buy the required number at that price.

Plaintiff brought action against the Western Union Telegraph Company to recover the cost of the cattle over and above $4.25 per cwt.

In the trial of the action the question was raised as to the competency of plaintiff's son to testify as to the market value of cattle on March 4, 5 and 6 in and about Streeter. The court held that inasmuch as he was a farmer operating a farm of eight hundred acres, and he occasionally purchased and sold cattle and had accompanied his father in their efforts to purchase cattle, he was qualified to testify.

It appeared that the owner gave plaintiff's son an offer good for March 1 and 2, and on this account the defendant claimed that the measure of damages was controlled by the state of the market on March 2 and that its liability became fixed on that date. It seems no evidence had been introduced to show the market on March 2. In this respect the court reasoned that plaintiff had not intended to purchase cattle for resale in the same market place, and that he had no knowledge of the failure to deliver the telegram until nine o'clock p. m. March 3. Early the following morning he proceeded to save himself as far as possible from injury on account of defendant's negligence. He used all required dili-

gence and was entitled to recover such damages as he suffered.

The holding of the court is plain, and, without any question, the law imposes upon a telegraph and telephone company the duty of delivering a message in due course unless some good and valid excuse was offered for its failure. The contract between the sender and the company obligates the company to deliver the message without interruption and at the earliest moment consistent with conditions and circumstances. No excuse was shown by the defendant for its failure to deliver in the usual time, and in the absence of such there can be no question as to its negligence.

Hanson v. Western Union Telegraph Company (Iowa), 146 *Northwestern Reporter,* 460.

Wireless Telephone on the D. L. & W.

Conversation by wireless telephone has been carried on between the Scranton and Binghamton stations of the Lackawanna railroad, a distance of 63 miles. Dr. Lee De Forest of New York spoke into the transmitter at the Scranton station and was heard by his assistant, C. V. Logwood in Binghamton.

The test broke the record, and the city of Scranton enjoys the distinction of being the place where the human voice was carried by wireless 13 miles farther than it ever was before.

A test of the wireless telephone between Scranton station and No. 6 passenger train due in Scranton from the west at 3:42 in the afternoon, was not successful because the motor generator of the apparatus in the station was not in proper working order.

Dr. DeForest is convinced, and so is the scientific world, that talking by wireless telephone is already successfully demonstrated between fixed stations. His purpose in bringing his apparatus to Scranton was to test it between a fixed station and a moving train.

Dr. De Forest started talking into the transmitter at noon to determine whether his voice could be heard by Mr. Logwood in the wireless room in the Binghamton station. He rejoiced to hear in a few minutes over the regular telephone from Mr. Logwood that he had been heard.

The first test of the wireless telephone was made around New York City, and the doctor was able to send his voice 25 miles over land between fixed stations. William Marconi, the wireless man, took the apparatus to Italy and talked 50 miles between two battleships in the Mediterranean sea.

After his success in talking to Binghamton, Dr. De Forest was hopeful of being able to transmit his voice to Mr. Logwood on "No. 6" train all the way between Binghamton and Scranton, but the vexatious kicking of the motor generator interfered.

Popularizing Long Distance

With reference to popularizing long distance talking, writes F. A. Bowdle, manager Cerro Gordon Telephone Company, Cerro Gordo, Ill., "I find that people do not hesitate to talk to their neighbors, merchant or doctor or the same exchange, although they are confronted sometimes with a busy line or faulty instrument. I am convinced, therefore, that the dread of 'long distance' is not caused by an unfamiliarity with the instrument or use of it, but by the fact that they have to pay for the privilege and the question (to them) as to whether or not they will get value received.

"I find that the best way to start my patrons to using long distance service is to keep carefully picking out those of my subscribers who are financially able, but unfamiliar with it, and suggest that they try our long distance service sometime, explaining that I would be glad to have a call put through for them free of cost to anyone they wished to talk to anywhere on our own or connecting lines. After the call is made I take pains to tell them the distance their call traveled, the regular toll for it and our method of putting the call through, also impressing on them the care we take to see that they get speedy service. One demonstration is all that is needed to break the ice. That my subscribers appreciate my efforts in their behalf is apparent to me from the steady increase in our toll reports."

Construction Work in Argentina

The public works department of the Rosario Municipality, Argentina, has reported favorably on the petition of Sr. A. Rechedei for a 40-year concession for a telephone system. At the expiration of the concession the property is to revert to the municipality.

The United River Plate Telephone Company has purchased the telephone business in Rio Cuarto and Bell Ville, and it is probable that these two towns will be connected with the city of Cordoba, where the company is erecting suitable premises for installing an automatic telephone exchange, the first to be erected in Argentina. The result of the working of this exchange will be watched with considerable interest, for if it is a success it will mean that this system will be established in several other cities in which the company is interested.

J. Basante has applied to the Municipality of Villa Rica for a concession to establish a telephonic service between the town and the railway station, also for a tramway concession, as well as one for electric lighting.

Bucharest-Vienna Telephone Service

The director of posts and telephones of Austria has issued a statement to the effect that a direct wire is now open between the cities of Bucharest and Vienna. Until further notice only one city in this country will be able to have direct telephone communication with Vienna, Cernovitcz, Lemberg, and Cracovia. The telephone rate for three minutes between Bucharest and Cernovitcz will be 3.50 francs (68 cents); between Bucharest and Lemberg, 4.50 francs (87 cents); between Bucharest and Cracovia, 5.50 francs ($1.06); between Bucharest and Vienna, 6.50 francs ($1.25). In the event of a demand for the quickest possible connection, the regular rate is tripled. The night rate (from 10 p. m. to 7 a. m.) is one-half the day rate.

Testing with Head Receiver

A very convenient method of utilizing a telephone head receiver for testing wiring and fixtures is as follows, says Howard H. Douglas in the *Electrical Review:* Take an ordinary head set with four or five feet of cord connected, and cut one wire near the terminal on the receiver. Connect these two open ends to the two terminals of a flash-light battery. This battery is then taped to the head band and terminals are put on each end of the telephone leads for making contact to the circuit to be tested. The battery is then in series with the telephone receiver and upon connecting to any closed circuit a click will be heard.

European Telephone Development

Translations from the Foreign Press and Communications from European Engineers

BY FRED W. SCHOLZ

THE rapid development of the city of Munich within the last decade has made it imperative to expand the present telephone equipment, and the Bavarian Telegraph Department, under whose jurisdiction the telephone work comes, decided therefore to install a new exchange that should be able to handle the increasing volume of traffic and communication. The following article will give a rather detailed general picture of this new equipment which offers some new features in various details.

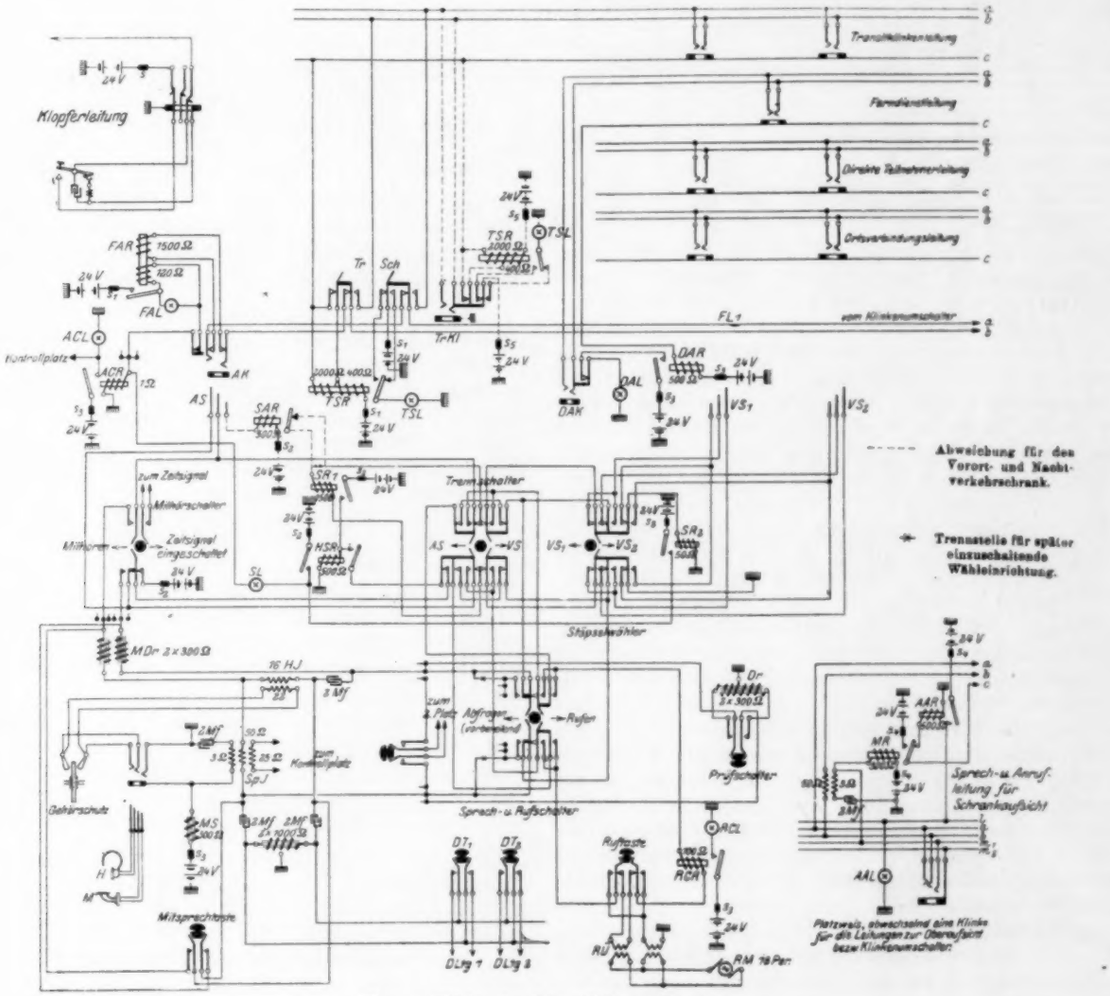

Klopferleitung
Abweichung für den Vorort- und Nachtverkehrschrank.
Trennstelle für später einzuschaltende Wähleinrichtung.
Sprech- u. Anruf. leitung für Schrankaufsicht

Fig. 1. Wiring for Long Distance Board.

THE NEW TELEPHONE EXCHANGE IN MUNICH.

The city of Munich is the capital of Bavaria and has a population of about 600,000 inhabitants, so that we may class it among the medium size cities in this country, though in Europe it stands among the larger cities. Munich has a great deal of long distance work, being the center of art and the goal of a great many visitors. The old exchange had been installed in 1899, but was insufficient for the growth in business. When planning the new equipment the department took the stand that it should not be any larger than would be required for the next fifteen years, in view of the fact that telephone engineering is rapidly developing, and that the equipment fifteen years from now would perhaps have to be superseded by more modern material. According to statistical estimates the long distance lines at that time would number 300, the suburban lines 60, and the main trunk group lines about 32. At present, however, the exchange has been equipped with 168 long distance lines, with 60 suburban lines 32 party line systems.

In estimating the size of an exchange we will have to consider the number of switchboards in the first place. The views as to the number of long distance lines to be connected to one switchboard differ very much. In order to obtain an exact picture of this problem the operating conditions were studied in detail. This study showed

that the maximum business that can be transacted at one operator's board during the day is about 400 distance calls. The load on such a line depends first on the length of conversation, which lies between 3¼ to 4 minutes, and, second, on the type of talk, whether local calls or trunk calls. If we take the calls that have to be sent to another exchange, at the rate of 15 per cent of the total traffic, it is seen that we may take 100 calls as the load for one distance line. Of the 134 lines in operation at the time, 63, or one-half, showed more than 100 calls per day. During the day the traffic was as follows:

Hours of traffic—o'clock:	8–9	9–10	10–11	11–12	2–3	3–4	4–5	5–6	6–7
% of total traffic:	9.8	10.5	11.5	10.3	8.14	9.15	8.3	8.5	7.5

As a maximum capacity per hour for the time between 8 and 12 and 2:30 to 6 o'clock we might take as an average 28 calls for the long distance lines and 35 calls for the shorter lines and local traffic. This figures up to an average load per day per operator of about 350 calls. The plan was worked out as follows:

12 switchboard places for each two long distance lines, total of 24 lines
32 switchboard places for each three long distance lines, total of 96 lines
12 switchboard places for each four long distance lines, total of 48 lines

56 switchboard operators places.....168 lines

For the suburban traffic we have in the same way, assuming 15 suburban lines:

300:3=100 long distance lines operators places.
60:15=4 suburban operators places.
60:8=approximately 8 party lines operators places; a total of 112 places or 112 telephone operators.

If we add to this number 50 per cent for the information, trouble desk, record tables, supervisors, pneumatic delivery service, etc., we have a total in the exchange of about 170 persons. In order to obtain hygienically correct conditions for the exchange room, the following observations were made: The amount of air to be changed per hour, having a ventilation system without drafts, is to be equal to no more than fivefold the cubic contents of the room in question. Pettenkofer found that the vitiation of air in a room due to the life processes and exudation and the waste gases of lighting is equal to the amount of carbon dioxide developed by these processes. The air in the room is satisfactory when the CO_2 content is no more than 0.7 per cent. The CO_2 content of the outside air is about 0.4 per cent on the average. According to these estimates the amount of air to be changed per hour per person is 57 cbm. The 170 persons require on the average 2000 cbm. air. The room is about 18 feet high, 44 feet wide and 125 feet long, so that these figures are practically exact.

The switchboards have been placed with their rear sides facing the walls of the hall. Rest rooms, locker rooms, lunch rooms, etc., lead into the great exchange hall just described. In the center of the room are the wire chief's table, the supervisor tables, the troubleman's table, information desks, all arranged so that new equipment can be installed with little trouble. The entire telephone exchange of Munich is at present being rebuilt, so that within three or four years all of Munich will use automatic systems. The difficult problem facing the department was therefore the combination of the older manual system and the newer automatic system. The principal part of the equipment is the following:

1. One main and intermediate distributing board for 500 long distance lines, only one-half being installed at present.
2. One testing board for measuring and testing the lines, arranged for 300 lines only, 200 being equipped at present.
3. One trouble switchboard for supervising the test board.
4. Long distance switchboards, as follows:

(a) 6 switchboards with 12 oeprators for each two long distance lines.
(b) 1 switchboard with 2 operators for each two long distance lines.
(c) 16 switchboards with 32 operators for each three long dsitance lines.
(d) 6 switchboards with 12 operators for each four long distanec lines.

5. Two switchboards for suburban and night service with four operators, each with 15 suburban lines.
6. Two switchboards for the party line system with four operators, each with eight party line wires.
7. Eleven recording places, one distributing place and eight auxiliary operations.
8. One pneumatic tube distributor with 70 openings, and at present 37 tubes and two time stamp apparatus.
9. One calculagraph and clock system for 60 calculagraphs, at present only 32.
10. Time signal apparatus, for the party lines only at present.
11. Eight information desks.
12. Two supervisor tables.
13. Auditory protective apparatus.
14. Current generating plant with six batteries.

Main and Intermediate Distributors:—The long distance lines reach the exchange partly underground, partly above ground, at present one-fifth being above ground, the rest underground. As the distance between outside wires and the main distributor is about 250 feet special 14-pair paper insulated cables with 1.5 mm. conductors have been used, having a low capacity.

Measuring and Testing Board:—This is at present equipped for 200 lines. There are two working places provided, having universal measuring instruments, four milliampere meters, that can also be used as ohmmeters. The third working place is used to control the operators and the conversations, if need be. There is room for 300 jack groups, 200 of six each for the long distance lines and 100 of four jacks each for combination. The coils for the combination lines are on an iron frame behind the board, as are also the coils for simultaneous operation. The pair of coils belonging to one of these combinations is screwed to a wooden board, which has on the upper side an eight-fold knife switch, allowing the rapid cutting in and out of all coils. At present 30 pairs of coils are in operation, although there is room for 100 pairs.

Trouble Supervisory Table:—This is similar to an ordinary writing desk. It has ten jacks and lamps, two pairs of cords, and a microtelephone outfit. Permanent lines are connected to the jacks, allowing constant communication with the local exchanges and the supervisors.

Switchboards:—The switchboards are placed with their rear facing the walls of the building. In order to give the maximum of light to the operators, the boards have not been made higher than 6 feet. The depth of the board is about 20 inches. The height of the working table on these boards, measured from the floor, is about 28 inches. The width of board space for each operator is about 28 inches, so that there is enough room for working and writing. All wooden parts of the boards and chairs are of mahogany. The lighting is in the form of channel lighting, as this was found to give the best light for the eyes. The jack panels of a switchboard used by two operators are in the center of the board. On each side of the ends are pigeon holes for formulas and papers. On the left side of each working place are two jacks, one for the long distance operator, the other for the supervisor. This latter is connected to the supervisory table and permits connection to the lat-

ter, as also to the wire chief's desk. Well insulated cotton-silk cables of low capacity are used. Those cables that are laid in channels in the floor are surrounded with a lead sheath. All relays, translators, inductance coils, etc., are fastened on the inside of the switchboard frames, for which reason a solid construction of the iron frames was especially desirable.

Jack Panels:—On the inner section of the jack panels are the call lamps, the calling jacks for the long distance, suburban and local calls and the transfer switches, which cut off the calling relays and connect the transfer or through lines to the long distance lines. The two suburban boards have room for 50 calling jacks and lamps, of which 30 only are used at this time. The number of the long distance trunk lines was determined according to the formula: $n = \frac{s\ f\ 12}{10.100}$ Here s is the number of calls for each operator, f = the number of calls received and sent per day, per operator, and 10 the number of calls that can be transmitted at any place per hour. There are two main exchanges in Munich proper, and five in the immediate suburban towns, with a total of 227 long distance trunk lines, which will be increased to 250 to have some extras. These long distance trunk communication lines are in multiple in the boards and have special signalling devices. Above them are strips for 20 direct connections, as those to the exchanges and official buildings. Above the direct lines are the interoffice trunk lines. Every operator's set consists of three plugs and cords, one answering and calling key, a cord switch, a cut-off key, a listening key and a separate key to work the time signal apparatus. All the cords are protected and are sufficiently long that they can be used for the neighboring board in case of need. For ticker service, there are several plugs at various boards which connect with the ticker board and apparatus. In the center of each board, between two operators is the tube for the pneumatic tube service, as also a calculagraph.

The long distance lines end in jacks and lamps, using a two cord system with cut-off relay of high self-inductance in bridge, as Fig. 1 of the wiring diagram shows. The long distance operators are enabled by means of their plugs to select the proper line, and then with their listening keys get into the listening position, and by means of another key to send current for a time signal through the lines. Each pair of cords has also a cut-off key. The calling and listening key of these operators allows the operator to connect to the lines coming from the cut-off key. The special calling current contacts of the cut-off key are wired so that, when the key is in the working position, calling current to the plug not to be used is interrupted, and current is sent either to the answering or to the connecting cord, depending on the position of the key. If this key is in the rest position, however, current is sent to the other cord, which is not to be used.

While the connection of a long distance call with a local call offers nothing especially interesting, it may be worth while to follow out a transfer call. Suppose a long distance call is received and the Munich exchange finds that it has to be connected onto another long distance or suburban line. She will place the connecting plug into the proper jack of the desired line, and will bring the call lamp *DAL* to light up. The other operator answers, designates the transfer line to be used, and by the use of her transfer key connects the long distance line to the transfer line. The former operator need only plug the proper transfer jack and thus make the connection between the two long distance lines. The final cut-off signal is always sent to the operator who first asked for the transfer connection. The cut-off signal is transferred to the second operator by means of the C-wire of the transfer line, since removing the plug at the first board makes the C-wire currentless, when the relay *TSR* allows its armature to fall away and makes the lamp *TSL* light up. At this signal the second operator brings the transfer switch into the rest position. The working contact at relay *TSR* is used to give to the operator of the second long distance line control over the proper choice of the transfer line by the first operator. The lamp *TSL* lights up at her place as soon as the first operator has put the connecting plug into the right transfer jack. The first operator can likewise tell whether

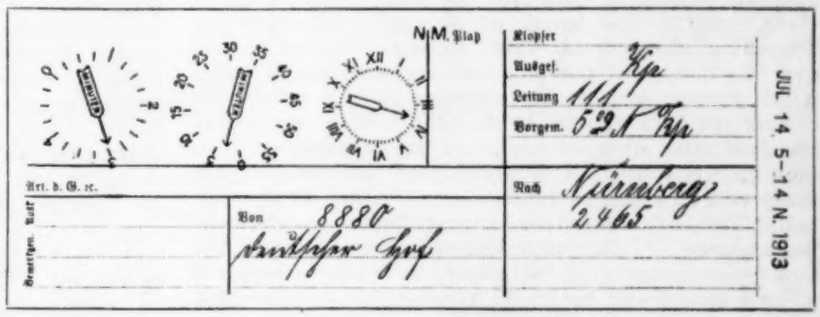


Fig. 2. Call Record Time Card.

the second operator has already used her transfer key, for the connection of the 200 ohm resistance in front of the 50 ohm *SR2* relay of the cord system makes the latter fall away and extinguishes the lamp.

Suburban Switchboards and Night Boards:—The suburban switchboards are similar to the other boards, except that the transfer switches are not used for the lines coming from the outside, and these are therefore led direct to the long distance calling relay. The cord systems differ in that the C-wire of the answering plug has an additional closing signal cut-off relay of 500 ohms. As the transfer switches are not used, the transfer jacks for these boards are separate. If some long distance lines wish a connection with a suburban line the two operators first agree on the transfer line to be used. At the suburban exchange the answering plug of the proper cords is placed in the jack of the transfer jack line *TrKl* and a connecting plug is inserted into the answering jack of the suburban line. Signaling between long distance and suburban board is similar to that between two long distance boards, except that the connection is made by the jack instead of by the transfer switch. The call is watched by the operator who first asked for the connection.

During the night the suburban boards are used for long distance traffic as well.

Switchboards for Long Distance Party Lines:—The four operators have four transfer places which are connected to the suburbs within a radius of about 20 km. around Munich. The 300 subscribers on these lines have practically local service, for if they remove their receivers the signal is given at the Munich party line switch-

board, and they have direct connection. After the connection has been made the operator presses the time signal button, which gives her an optical signal after the two subscribers have talked five minutes. The apparatus works as follows: On a common shaft of about 12 inches length are a number of notches, depending on the numbers of pairs of cords of two operators. There are the same number of iron tongues which are loosely fitted above these notches. The axis is rotated by a clockwork, which is released every six seconds by the standard clock. When at the beginning of a call, current is sent over the winding of the time electromagnet found with each iron tongue, by pressing down the button, the tongue tightens and is attracted. They are kept constantly on a rest contact on the axis by means of friction. The release of the time lever or button interrupts the current and the effect of the electromagnet is again interrupted. The hour axis moves the tongue through friction in the direction of the movement, this keeping up until the tongue finds its stop again at the back contact. The travel of the tongue measured between the working and rest position is such that the time of movement is about equal to the length of one call. Through the answering plug current flows during the time of call over the C-wire of the plug and the time signal relay, which current attracts the armature of this relay. By closing the back contact at the iron tongue, current is sent over the attracted armature of the time relay to the time signal lamp of the cords used, thus showing the operator that a unit of time is over for the call in question. This communication is made to the speakers by the operator. If the subscriber wishes to continue, the time lever is again pressed down, and this is repeated as long as the call lasts. To remind the operator that she is to register a double call, she uses a little marking plug in holes left at the side of the board. The system is arranged so that the operator cannot forget to use the time signal system and to register the call. If the answering plug is removed without counting the call time, the party line switch does not return into the rest position, and the lamp is not extinguished. When registering the time, the operator presses the lever twice out of its rest position, so that current is twice sent through the loop, and the relay arm at the party line switchboard is transferred to the recording contact. The current circuit of the recording apparatus belonging to that subscriber operates and closes the circuit. When recording is finished a buzzer announces that fact to the operator. Normally only one call can be counted, and the operator has to press the button twice or three times to register the call time, using, in doing so, a special multiple recording switch.

The Eleven Switchboards for Receiving Incoming First Calls:—These are all in form of tables and are automatically arranged so that any free operator can be selected. The twelfth place is used during the day as a sort of auxiliary place where all those calls that cannot be attended to anywhere else are taken care of. The distribution of the calls to free operators is done by automatic selectors, which tell the operators at these boards what other operators are free to look after the calls in question. The system was recently described in these columns, and need therefore not be given in detail. During low traffic hours and also at times when there are calls that have found no open operator a special distributing board is used. If the selector switch at the other boards finds the first nine contacts used, it will stop on the tenth one, which leads to the board in question. Here the call is answered and finished. When it was found that this one board was not sufficient six new auxiliary boards were equipped to which this one switchboard transfers all the calls not answered. The system is worked out so that these auxiliary boards are used only when the other operators cannot answer all the incoming calls. The operators at these auxiliary boards are usually kept busy with clerical work and do telephone work only during such hours. A rather good system used in this exchange is a large board placed in the center of the exchange hall, having the names of the various suburban and long distance exchanges, with note whether in order, in trouble and delayed. If there is trouble on any of the lines the proper cards are inserted and an audible signal is given, calling the attention of all the operators in the room to the line in question.

Electric Clocks, Time Signals, etc.:—The central clock used in the new exchange is made up of a standard central clock, four secondary clocks, 33 electric calculagraphs, 35 electric clocks for the calculagraphs and two electric date and time stamps. The current for the calculagraphs and clocks is taken from a 24 volt storage battery, while the electric date and time stamp is connected to the 110 volt municipal central station. The standard clock closes a contact every minute, a change in current taking place each time, so that every six seconds we have a direct current contact lasting two seconds. The minute contact is used to work the sympathetic clocks and time and date stamp, while the six second contacts are used for the calculagraphs and clocks. All the four secondary clocks are in parallel circuit to the current circuit, so that in case of trouble only the one clock need be cut out. The electric time and date stamps are used to register the exact time of every long distance call. After the registration has been made the time card is sent through the pneumatic tubes to the distributing operator, who stamps the time, so that each call is known exactly, the month, day, hour, forenoon or afternoon. The calculagraphs used register mechanically by merely pressing a lever the time when a call starts and the time it finishes, going within quarter minutes in accuracy. Fig. 2 shows the time card stamped by the electric date and time clock by the calculagraph. Reading the card we find that the Munich subscriber No. 8800 had started a long distance call on the 14th of July, 1913, at 5:14 p. m. The calculagraph impression shows that the call ceased at 5:18 p. m., and that the call lasted 3 minutes (extreme left dial). The extreme right dial shows the notch made by the machine at 5 and the hand points to the minute 18. The central dial registers the time intervals from five minutes to the next five minutes.

The exchange is provided with a pneumatic tube system by which the call record cards are sent through the entire exchange from every operator's place to a central distributing clerk, whose station is at this desk. The tubes are laid in reinforced concrete canals let into the floor. The operation has been very satisfactory from the standpoint of cleanliness, speed and efficiency.

There are eight operators at the information boards, most of which are in the shape of writing desks. The subscribers have call cards which are kept in alphabetical files in pigeon holes near these tables, so that any subscriber can find out information about his bill at any time. As long distance trunk lines have been connected direct to these information tables it is easy for information to give the same direct where required and thus save much valuable time. At present the information tables are still connected to the old manual system by

using common battery microphone current. Later on, when the entire system is automatic, they will be changed to that system and will be connected to the multiple frames. The microtelephones used at these tables have received special devices which allow the operator to shut out all other noises in the room so as to give all her attention to the inquirer.

The operators' speaking and listening outfit is wired parallel to the protective device which is to protect the ear of the operators. Each set of ten safety devices with the switch is mounted on a cast iron plate. The various sets are mounted on a U-shaped iron frame with holders and covered with a protective box. The ¼ h.p. electric motor used to drive the highly polished steel discs is connected to the municipal high tension current system. The rotating motion of the motor is transmitted by means of belt drive to the seven driving wheels of the various protective sets. Between the motor and the first driving wheel is a regulator. During the movement of the regulator a contact, over which the cut-off switches in operating position receive current, is permanently closed. In case of trouble this contact is released and the different safety elements are insulated from the operators' outfits by the cut-off switches, which are kept away from the apparatus.

Current Plant:—Station current (three phase) 110/0/110 volt is at the disposal of the exchange. The engines, motors and switchboards are in the basement of the building. The current source for the long distance boards, the party line system and the self-collecting pay telephone stations consists of six batteries, (a) one battery of 140 volts grounded in the center for the party lines; (b) a smaller battery of the same voltage, not grounded, used only when the other battery is being charged; (c) four batteries, each of 24 volts. Of these last four, two are always in operation, while the two others can be charged when needed. When computing the current source needed the following estimates were made: Batteries Ia and Ib have current for each 30 party line systems, and are connected direct without transformer to the high tension central station line, using resistances only. The storage batteries were built to give current for at least two days without recharging, so that we have 2 (days) x 24 (hours) x 0.15 (current) x 30 (systems)=216 ampere-hours. The number of calls at the party line board per loop per day is taken as 100, the time of call as 4 minutes. We have to deduct from the above figures, 2x30x100 (calls) x 4 (times) x 0.15=60 ampere-hours, which is equal to 216—60=156 ampere-hours for the two batteries. The battery II, used only when the other battery is charging, is safeguarded against sulphating by placing a resistance parallel to the battery, with whose aid the battery can be vigorously discharged every month for a few hours. The current for the 150 pay stations, figuring on an average of 20 calls a day, two minutes per call, is 0.025 amperes per pay station, making a total of 87 ampere-hours per day or 175 ampere-hours for the two days the battery is to supply current. For the real long distance batteries the number of calls per line per day was taken at 100, with 4 minutes time for the call, and six seconds for the call and signal lamps, and 10 seconds for the closing lamp. The incoming traffic was figured at 54 per cent, the outgoing traffic at 31 per cent, and the transfer traffic at 15 per cent of the total traffic. The total current adds up to 555 ampere-hours, and a battery for 580 ampere-hours was installed. To charge the 24 volt batteries a direct current transformer is used. The wires for the call current alternating current are placed in special pipes separate from the other wires. The following table gives detailed figures as to the current required for the various operations, and is therefore quite interesting:

Operations required.	Time of Call Per Day and Line	No. of Lines.	Current Strength.	Amp.-hr. Required.
Call circuit current (69%)..	100	360	0.13	5.40
Transfer closing lamps (15%)	100	360	0.1	2.40
Transfer closing relays (15%)	100	360	0.01	3.60
Finished call lamps.....	100	360	0.1	10.0
Finished call relay	100	360	0.048	4.80
Calling lamps (50% of call lamps)	100	360	0.1	3.0
Supervisory lamps	100	360	0.1	2.0
Trunk line call lamps (15%)	100	360	0.1	0.90
Trunk line call relays (15%)	100	360	0.01	0.30
Time signals (85%).....	100	360	0.1	20.40
II. A+operators.				
Call over A—lines, electro-magnet with return (31%)	100	360	0.048	3.00
Cut-off and calling relay (31%)	100	360	0.18	33.40
Calling lamps (31%).....	100	360	0.1	1.86
III. Supervision.				
Control lamps at all places..	118	...	0.1	2.95
Except A—(incoming) boards, control lamps at A—boards.	24	...	0.1	1.20
Exchange telephone micro-phones	157	...	0.05	70.65
Current for caculagraphs and time clocks	144	120	0.05	24.00
			Total current=189.86	
(Note: % shows percentage per call.)			Amp-hrs. per day.	

—*Elektrotechnische Zeitschrift.*

Cincinnati Bell's Vacation Home

President Bayard L. Kilgour and the other directors of the Cincinnati Bell Telephone Company recently went in a special car to Hazelhurst, the vacation and recuperation home for female employes of the company, at Mt. Healthy. The trip was taken to make an inspection of the home, which was later formally opened. President Kilgour said the estate was acquired for the express purpose of having a summer place for female employes of the company where they can spend their vacations or to recuperate at any other time.

The ground is ten acres in extent and is covered with fruit and shade trees, lawns and all paraphernalia for summer outings and contains a large and commodious house equipped with all modern conveniences. The selection of Hazelhurst was made after Hamilton county and part of Northern Kentucky was searched for a favorable place. Hazelhurst stands on the highest point in Mt. Healthy.

"Everything is free to the female employes of the company, while they are sojourning there, and they will be in every respect the guests of the company," said President Kilgour recently. "Any female employe may spend her vacation there, by making application, and arranging the time. At other than vacation time any female employe disabled by illness or otherwise can go there by making application to the manager of her department, who will send her name to the secretary of the employes' disability department.

The American consul at Teneriffe, Canary Islands, reports that the Ayuntamiento of Las Palmas, Grand Canary, is advertising for bids for the entire replacement of the telephone system of that city, which has a population of 63,000. As the bids must be accompanied by samples, etc., and must be submitted by May 11, American firms will not be able to compete, but may be successful in selling some material and equipment to the firm securing the contract. In case none of the first bids is accepted, a new competition will be opened, in which case it might be worth while for American companies to send out representatives.

Workmen's Compensation and Employers' Liability

Address Delivered Before the Motor Truck Club of America

BY EDSON S. LOTT

MOST foreign countries and more than a score of the commonwealths of the United States have enacted workmen's compensation laws. Many more states will soon enact such laws. These laws are intended to take the place, so far as may be possible, of employers' liability laws.

Lawyers and lawmakers, employes and employers, politicians and "plain people," all with the possible exception of the employers of farm laborers and of domestic servants (and they ought not to stand out), agree that "the industry" should bear the burden of broken soulful machinery as well as the burden of broken soulless machinery; all agree that civilization everywhere has outgrown a system which causes seven workmen out of each eight receiving accidental disabling bodily injuries to bear all the consequences thereof themselves.

EMPLOYERS' LIABILITY LAWS DEFINED.

What is meant by "employers' liability" laws?

Such laws are a combination of common law (judges' decisions) and statutory law (legislative enactments).

Such laws provide that when a workman receives an accidental bodily injury caused solely by the fault or negligence of his employer or his employer's representative, the employer must pay such injured workman "damages," the amount thereof depending theoretically upon the damage the workman has sustained, but actually upon one or more of several things, such as:

1. The generosity (and the ability to be generous) of his employer.
2. The skill and resourcefulness of his lawyer, if he employs one.
3. The attitude of the judge and the sympathy of the jury, if he goes to court.
4. His own cleverness in placing upon his employer the blame for the accident.
5. The alertness and diligence of the employer in gathering evidence to prove that the blame for the accident can not be placed on him (the employer).

Employers' liability laws are so complex and the statements of the witnesses of the accident frequently are so conflicting that it is often impossible to decide in advance of a court trial whether the employer is legally liable to his workman for the damage he has sustained by reason of an accidental bodily injury.

In a great majority of cases the employer is not *legally* liable.

The records show that during the past several years employers have paid, on an average, damages to one injured workman only out of each seven or eight of the hundreds of thousands who have been hurt. And probably not even one in eight was entitled by law (employer's liability law), to damages; that is, probably not one accident in eight is caused solely by the negligence of the employer. (The broadening of employers' liability laws through legislative enactments and judges' decisions as well as the tendency of juries to be more liberal in awarding damages to injured workmen, brought about by the country-wide agitation for workmen's compensation laws, are constantly increasing the number of court verdicts against employers and also are constantly increasing the amounts paid to injured employes in those cases where the employer is not sued.)

WORKMEN'S COMPENSATION LAWS DEFINED.

What is meant by "workmen's compensation" laws?

That every workman who sustains an accidental bodily injury in the course of his employment shall receive "compensation" from his employer; usually medical, surgical and hospital treatment and medicine during the first few weeks and one-half wages thereafter while disabled, subject to some limitations; in case of death the employer must pay to the workman's dependents" compensation equalling, usually, one-half wages for a certain period of time.

There are many modifications of the outline stated.

Frequently there is a minimum and a maximum amount of compensation payable.

But all workmen's compensation laws the world over set aside the question of who is at fault for the accident, unless it is caused by the wilful (or like) act of the employer, when he must pay an extra amount of compensation, or unless it is caused by the willful (or like) act of the workman, when he is barred from any compensation, under some statutes.

EFFECT OF WORKMEN'S COMPENSATION LAWS.

The effect of workmen's compensation laws is to cause employers to pay something (either for doctors' bills or for "compensation," or for both), every time a workman is hurt; whereas under employers' liability laws the employer pays, on an average, "damages" to one out of each eight workmen injured and nothing at all (except the cost of litigation) in seven out of each eight such cases.

Moreover, the employer must pay, on an average, a larger amount to each injured workman under a workmen's compensation law than he has to pay to one out of each eight injured workmen under employers' liability laws. (But this will not long be so, because of the tendency to increase the awards for "damages." Failure to recognize this fact would soon force insurance companies into bankruptcy).

Liability insurance companies issue policies whereby they assume the liability of employers for accidents to their employes.

The average payment to employes per notice of injury received by insurance companies is steadily growing in size, but the cost for medical attention alone under workmen's compensation laws will average a large part of the total amount now paid under employers' liability laws. In France the workmen's compensation law is known as the "doctor's graft" law.

From the above it is easy to see that insurance premium rates must be many times more for workmen's compensation coverage than for employers' liability coverage of a few years ago.

Under workmen's compensation laws injured workmen will receive a larger percentage of the insurance premiums paid by their employers than is the case under employers' liability laws, for under certain conditions some items of expense of insurance companies will be smaller under workmen's compensation laws than under

*President of the United States Casualty Company.

employers' liability laws. Moreover, injured workmen will not so frequently be obliged to give lawyers one-half the amount they receive—it will not so frequently be necessary for them to employ lawyers—their rights will be far more easily ascertainable. Workmen's compensation laws will be largely automatic.

COVERAGE OF EMPLOYERS' LIABILITY INSURANCE.

Employers, as a whole, buy employers' liability insurance to cover only their legal liability—absolutely nothing more. The insurance they are willing to pay for does not go beyond the liability imposed by law upon the employer, and such liability does not have anything to do with the pain and poverty of the injured workman nor with the suffering and distress of his family unless negligence of the employer is first proved. The employers' liability law says that, no matter how severe an accidental bodily injury to a workman may be, no matter how worthy and needy the injured workman may be, no matter how many may be dependent upon him for their existence, the employer shall not be called upon to pay damages unless the accident was caused solely by the fault or negligence of the employer.

Insurance companies have sold and still sell policies which pay the doctor's bills and wages of injured workmen, while they are laid up, irrespective of who was at fault for the accident, but only a very few employers will pay the necessarily high price for such policies; indeed, only a very few can afford to pay the price—unless all do, otherwise the more humane employer would be at a disadvantage with his less liberal competitor. (In actual practice insurance companies pay thousands of claims of injured workmen each year when there is no legal liability on the part of their employers. This is done by reason of a combination of business and humanitarian reasons. When an employer is in direct litigation with his workman, he is often governed by strong prejudice and passion; that is, he feels keenly a personal injustice. Insurance companies deal with such things impersonally, calmly and dispassionately).

THEORIES OF THE OLD AND OF THE NEW LAWS.

The theory of employers' liability laws is that the employer is not his workman's keeper; that if the workman gets accidentally hurt through no fault of the employer, then there is no more reason why the employer should take care of him and his family while he is laid up than there is why anyone else should do so; that is, that because one gives another man employment he (the employer) should not be expected to take care of the employe while he is laid up from an accident, unless the accident was caused by the fault of the employer.

The theory of workmen's compensation laws is that (eliminating fraud) every industrial worker and his dependents are entitled to "compensation" for every disabling accidental bodily injury sustained by the worker in the course of his employment, without question as to how the accident happened or who was at fault for it; and that the cost of such compensation shall be charged up to the industry (the same as coal consumed and machinery broken and worn out), and passed along to the consumer—the public.

It is said that the workmen's compensation principle begins where the employers' liability doctrine ends.

The activity of reformers, the demand of labor, the knowledge of employers, the belief of the multitude, the expedience of legislators, as well as the broad humanitarian principle involved, are combining to bring about the enactment of workmen's compensation laws everywhere.

DANGER OF HASTY LEGISLATION.

I am in favor of workmen's compensation laws as distinguished from employers' liability laws.

But I am greatly concerned lest lawmakers, through their desire to do justice to employes, do injustice to employers, which will finally react on the employes. Only a few realize the far-reaching consequences of drastic workmen's compensation laws. Employers should not oppose all workmen's compensation laws. Such a course is likely to end in the enactment of ill-advised laws. Employers should foster the enactment of reasonable workmen's compensation laws.

Of course this suggestion is lost on those of you who are doing business in the State of New York, inasmuch as your opportunity to help shape a law which will be just to the workman without being unjust to the employer is gone. Henceforth you will operate under the most drastic workmen's compensation law in the world. Indeed, I regard the New York Workmen's Compensation Law as the most momentous, the most far-reaching legislation enacted by this state in many a long year.

While this legislation was pending you either sat indifferent, else you idly kicked against *any* workmen's compensation law, both foolish positions.

A question frequently asked by an employer is: "What will be my insurance rate under a workmen's compensation law?"

The only answer is: "It depends upon the provisions of the law."

If a builder is asked: "How much will you charge to build a house," he must necessarily reply: "It depends upon the plans and specifications."

In every state where a workman's compensation law has been passed, employers think that the insurance rates are too high. Indeed, the average employer (wherever located), thinks his employers' liability insurance rate is too high, just as the buyers of your product think that your prices are too high.

INSURANCE PREMIUMS AND LOSSES.

Let us reason together about the rates for employers' liability and for workmen's compensation insurance.

In an effort to keep up with the increasing liability of employers, the rates for employers' liability insurance have been largely increased from time to time, each increase being resisted by employers, even though no general increase has been sufficient to save the insurance companies from an ultimate underwriting loss. There will be still greater resistance on the part of employers as respects rates for workmen's compensation coverage, even though it is evident that workmen's compensation laws will call for larger payments to injured workmen and their dependents than the old employers' liability laws.

Employers have sometimes taken the total premiums received by some liability insurance company during a given year, placed by the side thereof the losses actually paid during the same year, and called the difference "profit."

This is the usual method of ill-advised social reformers when claiming that the whole operation of insurance companies constitutes an "economic waste," and it is the bait used by dishonest promoters of a new insurance company when selling its stock.

Mr. Arno Dosch has said, in *Everybody's Magazine*:

The ten largest (liability insurance) companies collected $23,523,585 in premiums during the years 1906, 1907 and 1908, but paid to injured workmen and their widows only $8,559,795, a little over one-third. In other words, injured workmen received, on the whole, one-third of what they would have received if their employers had distributed among them pre-

miums paid to the insurance companies. The rest went to pay dividends, lawyers' fees, salaries of the wily claims agents and "expenses."

The claims paid during the years mentioned by Mr. Dosch do not by any means measure the insurance companies' losses arising from accidents happening during those years. The insurance companies are still paying claims arising from accidents happening during those years. The claims Mr. Dosch mentions as having been paid in the years cited did not (except in a minority of cases), arise from accidents happening in those same years, but instead from accidents happening in former years.

LOSSES LONG DEFERRED.

In life insurance the liability of the insurance company is fixed when the insured dies. The liability of the fire insurance company is known as soon as the fire occurs and the value of the property burned or damaged is ascertained. It is far different in employers' liability insurance, where practically all losses are (from their nature) deferred and indefinite. Sometimes the loss is not ascertainable until ten, fifteen or twenty years after the accident occurs. If an accident happens while the policy is in force, and the company is notified, then the company must pay the loss whenever it matures

Sometimes a workman sustains a trifling accidental bodily injury and without inconvenience keeps right at work for the same employer for years, and then is discharged, and then the injury becomes "serious" and then (if the statute of limitations of from one to seven years will permit), a suit for damages is brought against the employer. Sometimes an injury does not amount to anything "worth while" until the right lawyer gets in touch with the injured person, and then it has a commercial value—and a suit for damages against the employer follows. A minor is sometimes injured and no one who is authorized to bring suit considers that the injury lessens in the slightest degree the earning power of the one injured, but when the minor becomes of legal age he thinks differently, and sues his old employer for damages. Delayed claims and suits of workmen for damages arising from bodily injuries are a source of great cost to every liability insurance company. The company must keep "in touch" with every accident reported until it is settled or outlawed.

COMPENSATION LOSSES CUMULATIVE.

As respects losses under any workmen's compensation law, the number of payments of compenastion to injured employes and their dependents will be cumulative—as accidents happen—one added to another, as the years go by. Payments due to this year's accidents will begin this year and extend into other years, next year's payments will be added, the year following two year's payments will be added, the year thereafter three years' payments will be added, and so on. The total of such payments will start low and increase each year.

The insurance premium should be sufficient to carry all payments to maturity.

For the purpose of making these deferred compensation payments, insurance organizations must carry large reserves, and these reserves must come from premiums.

THE NEW YORK LAW.

Payments of compensation to injured workmen and their dependents will run for a longer time under the New York law than under any other law, for the reason that here we must pay compensation during the life of the injured workman, if disability lasts that long, and during the life of his dependents, if the injury causes death, whereas under other laws such payments only run during a certain number of years or until a certain total amount has been paid.

A SPECIFIC CASE.

Suppose that, after June 30, you hire an extra man for a week during some rush season.

Suppose that he is 24 years old, has a mother 45 years old, a wife 22 years old, a child 2 years old, and another child 1 month old, all dependent upon him for support.

Suppose you agree to pay him $20.00 for his week's work, that being the going wages.

Suppose he is killed during that week.

What may be the ultimate cost to you (or to your insurance company) for giving that young man one week's employment?

Listen:

	Annual Compensation	Duration in Years	Total
Wife—Aged 22 years	$300	50	$15,000
Child—Aged 1 month	100	18	1,800
Child—Aged 2 years	100	16	1,600
Mother—Aged 45 years	150	25	3,750
			$22,150

Some one asks: "Are all employers in the state of New York subject to this new law?"

No; only those employing workmen in a trade or business specified—or included in general terms—in some one or more of the forty-two "groups" enumerated in the law.

THE LAW APPLIED TO MOTOR TRUCK TRADE.

As respects the motor truck trade, I am not sufficiently familiar with the business of each of you to say just which are "in" and which are "out," but I may say those workmen are covered by the New York Workmen's Compensation Law who are engaged in the operation of machine shops; power plants; longshore work, including the loading or unloading of cargoes, or parts of cargoes of grain, coal, ore, freight, general merchandise, lumber or other products or materials, or moving or handling the same on any dock, platform or place, or in any warehouse or other place of storage; construction, installation or operation of electric light and electric power lines; dynamos, or appliances, and power transmission lines; operation and repair of stationary engines and boilers; manufacture of traction engines, wagons, carriages, sleighs, vehicles, automobiles, motor trucks; the operation, otherwise than on tracks, on streets, highways, or elsewhere of cars, trucks, wagons or other vehicles, and rollers and engines, propelled by steam, gas, gasoline, electric, mechanical or other power or drawn by horses or mules.

I guess that at least some of you are "in."

EVERY ACCIDENT COSTS MONEY.

If you have workmen engaged in any of the employments I have named (and they are only a few of the employments covered by the law), you must pay something for every disabling accident to such workman, either doctors' bills or compensation, or both.

The only exceptions are when the accident is caused by the willful intention of the injured employe, or when it results solely from his intoxication while on duty. Otherwise it does not matter how the accident happens or who causes it, if it arises out of and in the course of his employment.

Compensation payments begin after fourteen days of disability.

SCALE OF COMPENSATION.

The New York scale of compensation is, generally speaking, two-thirds of the injured employe's average weekly wages for the year previous, but not less than five dollars per week, nor more than fifteen dollars per week,

excepting for the loss of hand, arm, foot, leg or eye, when the higher limit is twenty dollars per week. The payments must continue while the disability lasts.

If the injury causes the death of the workman, then the compensation must be paid to his dependents, those who were dependent upon him for support.

The employer must also pay for "such medical, surgical or other attendance or treatment, nurse and hospital service, medicine, crutches and apparatus as may be required or be requested by the employe, during sixty days after the injury."

In cases of death the employer must pay the funeral expenses, not to exceed one hundred dollars.

ANOTHER ILLUSTRATION.

As showing what it may mean to employers operating under the law, I quote from a pamphlet written by P. Tecumseh Sherman, a high authority, as follows:

For permanent total disability every workman who is in receipt of wages of $22.50 per week or over, when injured, will be entitled to the maximum weekly payment of $15.00, or an annual pension of $780.00 for life. What will be the average cost of such pensions is an actuarial question. But foreign experience indicates that those drawing permanent disability pensions have a surprisingly long life expectancy. Consequently such pensions may run for sixty years or more, so that an aggregate of $46,800 in a single case may not be unusual.

The law is to be administered by the State Workmen's Compensation Commission, composed of five members appointed by the governor.

When a workman is disabled, the commission will decide the weekly compensation to which he is entitled, and it will collect the amount from the employer (or his insurance company) and pay it over to the workman. In case of the workman's death, the compensation will be paid to his dependents by the commission.

The commission is composed of exceptionally high-grade, broad-minded citizens who will deal out as even-handed justice as the law will permit.

A gentleman asks: "Is there no escape from this law?"

INSURANCE COMPULSORY.

No; the penalty is too great. Moreover, to make sure that injured workmen and their dependents will certainly receive the compensation which the law grants, the law requires employers to secure the payment of compensation in one of the following ways:

By insuring in a stock casualty insurance company;

By insuring in a mutual casualty insurance association;

By insuring in a State Insurance Fund;

By demonstrating to the State Workmen's Compensation Commission such financial solvency (or by depositing securities) as will warrant the commission to permit them to carry their own insurance.

STATE INSURANCE FUND.

As respects the State Fund, the law reads as follows: "There is hereby created a fund to be known as 'The State Insurance Fund,' for the purpose of insuring employers against liability under this chapter and of assuring to the persons entitled thereto the compensation provided by this chapter. Such fund shall consist of all premiums received and paid into the fund, of property and securities acquired by and through the use of moneys belonging to fund and of interest earned upon moneys belonging to the fund and deposited or invested as herein provided. Such fund shall be administered by the commission without liability on the part of the State beyond the amount of such fund. Such fund shall be applicable to the payment of losses sustained on account of insurance and to the payment of expenses in a manner provided in this chapter."

NO MONOPOLY OF INSURANCE.

I am very sorry that there is not time for me to tell you why stock casualty company insurance will be much better for you than any of the other kinds the law permits you to carry, but I must take the time to say that while I believe that stock insurance offers the best and safest insurance for employers under the New York Workmen's Compensation law, yet I think that our lawmakers were wise in providing various means of insurance—as against a monopoly of any one kind—for by so providing each form of insurance must compete against all other forms, thus giving insurers ample opportunity to note how each kind works out in actual practice.

PRINCIPLE OF COMPENSATION ALL RIGHT.

The *principle* of workmen's compensation laws as distinguished from employer's liability laws can be successfully upheld from any and every point of view, and from adding that the greatest duty of stock insurance companies, mutual insurance associations, the State Fund, and all employers of labor is the closest possible cooperation for the prevention of work accidents.

The prevention *of* accidents is worth all the compensation *for* accidents in the wide world.

Railroad Wireless Interferes With Navy

The ships of the Atlantic fleet, on their way to Mexican waters, were cut off from all official communication by wireless unintentionally by a D., L. & W. passenger train speeding through the meadows of New Jersey. The official messages to the battleships which were interrupted were being sent from the wireless station at the Navy Yard in Brooklyn. The wireless waves of the government's apparatus were confused and blurred by the waves sent out by the wireless telephone apparatus at the Lackawanna railroad station at Hoboken, which communicated for the first time successfully to the Lackawanna limited ten miles away.

The Lackawanna limited, equipped with its new wireless telephone apparatus, carried L. B. Foley, the railroad's superintendent of telegraph, who first installed the wireless telegraph apparatus on the Lackawanna limited.

Soon after the train was lost to sight in the meadows the operator at the fixed wireless telephone station in Hoboken started his electric generators going and set his instruments in tune. The operator on board the moving train adjusted his receivers. In a few minutes the operator at the fixed station in Hoboken was informing the operator on the train of the disagreeable weather conditions in and about New York City and of other things of equal importance.

The wireless telephone apparatus which Japanese officials of the department of communications are credited with having invented was successfully operated early in June, according to statements made by the parties concerned. From the Yokohama station limited conversations have been carried on with Japanese steamships as far distant as sixty miles.

A serviceable pocket telephone is the latest innovation of the Hungarian Posts and Telegraphs Administration. The appliance weighs only 120 grammes, is no bigger than a card case, and can be had by any one on payment of the price of forty ordinary telephone conversations, which cost a penny each.

Give Farmers Free Toll Service

An opinion has been obtained by the Nebraska Railway Commission from the attorney-general's office, holding that it is not discriminatory for a telephone company to give rural subscribers service on an additional exchange for a flat charge of 50 cents per month over and above the regular rate for local service, when town subscribers are required to pay toll rates on calls to the same exchange.

The railway commission has permitted this to be done at Benedict, where the Lincoln Telephone and Telegraph Company owns the exchange, and at some other places, including Stromsburg, where the plant belongs to the Polk County Telephone Company. Some of the town subscribers protested the arrangement, and the commission asked the legal department to construe the law.

As viewed by Assistant Attorney-General Edgerton, the farm telephone user has many disadvantages, compared with the town subscriber. In the first place, there are a large number of people on the same line, and the rural patron often has to wait a long time until he can get to use the telephone. Another handicap is that some rural lines extend out from one town and in the same neighborhood other rural lines will be attached to a neighboring town. If farmers living near each other, but connected with different exchanges, were required to pay toll charges between the towns, it would make it unduly expensive for them to communiacte with each other, Mr. Edgerton holds.

The special rate of 50 cents per month for this kind of connection is held to be a partial offset of the disadvantages suffered by rural telephone users, and not discriminatory as against town patrons.

Telephone Efficiency

A newspaper man in Philadelphia made an interesting test the other day, says the Cleveland *Leader*.

First, he called up ten offices in the city hall by telephone, one after another. By means of a stop watch he ascertained that it took 105 seconds, on the average, to establish connections and begin conversation.

Next he called up ten subordinates in as many banks and business houses. The average time for establishing talking connections with them was only forty seconds.

Undoubtedly something like the same ratio of alertness and activity would be arrived at by the same test in almost any large city in the United States and probably in most of the smaller ones. Which naturally suggests the question: Why does it take about two and a half times as long to arrange for a conversation by telephone with a public employe as it does with one engaged in private business?

But it is hardly necessary to ask the question. Anybody can answer it.

Chicago Indorses "Hoefer" System

Chicago experts have joined with B. E. Sunny, president of the Chicago Telephone Company, in advising against interference with the installation of the type of coin box adopted as the successor of both the "nickel first" and "nickel last" devices.

Bert H. Peck, city telephone supervisor, told the committee on gas, oil and electric light the new device, known as the "Hoefer" system, is the best that has been devised to meet complaints directed against its predecessors. With the "Hoefer" the lifting of the receiver establishes a talking connection with the switchboard and the dropping of a nickel establishes another, showing the operator the coin is in the box.

Supervisor Peck said calls over eighty lines equipped with his system showed a large majority of the subscribers well pleased. He also said, in answer to a direct question from Ald. C. E. Merriam, he considered a "distinct improvement" had been made over both the previous types of service. In this he was supported by two superiors, Montague Ferry, former telephone supervisor and now commissioner of public service, and Ray Palmer, commissioner of gas and electricity.

Mr Sunny sent the committee a letter which, while it did not argue the merits of the "Hoefer" system, urged that the present installation work be allowed to continue, as interference might damage the service on a large number of nickel telephones.

Must Sell Telephone Service to Competitors

Telephone companies in Kansas must furnish service to competing companies when it is shown that such service will accommodate the public. This is the substance of an opinion handed down by the Public Utilities Commission in ordering the Northeast Kansas Mutual Telephone Company, the Morrill Mutual Telephone Company, and the Robinson Mutual Telephone Company to furnish service to the Hiawatha Telephone Company. It is expected that the mutuals will take the case into the courts.

The decision of the commission, if upheld, will be of far-reaching importance to patrons of rural lines particularly.

"It is shown that the public using the service offered by either of these companies would be accommodated by interchange of service," according to the commission. The ruling does not require that these companies put in switchboards, but merely that one company can force the other to install a telephone in the first company's office at regular rates for convenience in notifying patrons of calls over the other line.

A Real Aerial Telephone Line

The modern telephone trouble man has taken the word "impossible" out of the telephone dictionary for good. A little thing like restoring service after storms and floods offers no serious obstacles, as witness the manner in which service was maintained during a recent storm in California.

A flood in the Salinas River district had washed away pole after pole and the problem of keeping up the wires until the waters should recede presented almost insurmountable difficulties. The familiar box kite provided the solution. The telephone company's men carried a bridle wire across the river by means of a number of large box kites and then used this strand as a messenger for drawing the telephone wires across.

Talking was carried on successfully over this kite line until the recession of the waters permitted the laying of a permanent cable.

L. R. Parker, vice-president of the People's Telephone Company of Leavenworth, Kas., has agreed with the War Department on the terms of a proposed sale of the plant of the telephone company at Fort Leavenworth to the government. Otherwise, the War Department had decided to construct a plant of its own.

Maintenance of Railway Telephone Equipment

Paper Read Before the Association of Railway Telegraph Superintendents

BY M. B. OVERLY*

PRIOR to the adoption, by the railroad companies, of the telephone for train dispatching and other purposes, little attention was paid to the construction and maintenance of the inside plant. A brief inspection of the wiring of the average telegraph office even today will prove this to be true. This is all being changed, however, and the general tendency is towards better construction and a higher class of maintenance. The telegraph company is rapidly improving its standards, both as to the class of equipment it uses and furnishes and to the manner in which it shall be installed and maintained.

In looking over the installation of telephone equipment that has been made by the various railroads one will find many different methods in use. Each road seems to be following its own particular specifications, or lack of specifications. Some of these appear to be good and some bad. I believe, however, that all are beginning to realize the need of doing things right. Every department of the railroad is rapidly reaching a point where it will depend upon company owned telephones with which to handle its business. No one wishes to give anything but the best service that can be produced. To do this will require the building up of an organization that will work together harmoniously, intelligently, and diligently. We will find that first-class maintenance spells first-class service and that poor maintenance spells failure. We must adopt and use a standard of maintenance that will bring about the highest possible efficiency in our telephone and telegraph service, and I believe only the highest class of maintenance will do this.

Every superintendent of telegraph who has telephone train dispatching on his road has done a lot of thinking upon the question of maintenance and just what methods he shall use to handle it in the best way. Every man has, no doubt, asked himself many, many times what kind of employes he shall use on this class of work. He has wondered whether he shall divide his territory into small districts and have his stationed linemen do all the work, both inside and out in a given territory, or whether he shall divide his territory among the stationed linemen without regard to the telephone equipment and employ telephone inspectors or maintainers to look after the equipment. I believe there are several correct answers to this question, because the problem is just a little different on each railroad. It would seem that one man in going over a given territory should be sufficient and that he should take care of all classes of work. It would seem that too much time is wasted in riding on a motor car from station to station when no work is being done other than equipment inspection.

Our own experience was probably very similar to that of all other roads. We built and equipped seven telephone dispatching circuits in about three months. None of our regular men knew anything about telephones and few of them knew what a selector looked like. Our installers were telephone men we picked up here and there and a few of our stationed linemen were used to help out. When we finished the installation of the first circuit we immediately put it into service and started to work on the installation of another one. We had scarcely left that territory, however, before little things began to happen on that circuit. We had no wire chiefs and our chief dispatcher and dispatchers knew nothing about testing on telephone circuits. If a fuse blew out in the main battery or some simple trouble developed, there was no one who knew how to make the simplest kind of a test. This resulted in our being compelled to take the best man available, out of one of our gangs, and put him in charge of the telephones on that division. This man had been a lineman at one time, but he had developed into a telephone equipment man and finally into a telephone wire chief. Because of the fact that we had no wire chiefs he had to be a sort of a traveling wire chief and equipment inspector. If a case of trouble came in he first made a test to find out whether it was line trouble or equipment trouble; if it proved to be line trouble the stationed lineman went after it, but if it proved to be equipment trouble the inspector went after it himself. At first we did not tie him down to any very hard and fast rules to follow, but allowed him to use his own judgment to a considerable extent. As time went on, however, we employed wire chiefs for all of the more important points on our road. These men immediately took charge of all testing and in addition to this looked after the handling of duplex apparatus and telegraph repeaters and in some cases also acted as manager of the office. We then relieved the inspector of all testing and required him to inspect every office in his territory at least once every thirty days. We required him to inspect the dispatchers' master equipment and main battery once each week. On his inspection trips, the inspector carried with him a supply of cords, mouthpieces, receiver shells, diaphragms, etc., together with a supply of dry batteries, so that he could fix up any case of trouble that might develop. Our aim was to anticipate trouble rather than to wait until it came. These men were each given about three hundred miles of road on which there is a dispatchers' telephone circuit, a station to station telephone block circuit, and a number of siding and yard telphone circuits. We supply them with simple blue prints of all circuits in use in their territory. They are also supplied with all specifications that we get up or use and we try to keep them supplied with everything they may need in the way of telephone apparatus parts. We believe it pays to keep these men well supplied, so that they do not have to wait on equipment to clear trouble. I overheard a superintendent remark a year or two ago that he made his men coax him for material so they would not use so much. In my opinion, a policy of that kind can only result in disaster. The men will be compelled to do shoddy work and will gradually drift into doing that kind of work at all times.

A friend of mine was employed a year or two ago by several large independent telephone companies to go over their plants to determine, if possible, why their transmission was below the standard of efficiency. The first thing he did was to look over their physical plant to see what class of construction had been used and to find out how it was being maintained. He found a large part of this answer in the maintenance. An inferior and inexperienced class of men had been employed and they had gradually allowed the plant to become demoralized, and

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not a man of them knew what was wrong. Loose connections, unsoldered joints, incorrect circuits, etc., were in evidence everywhere. He immediately started men to work to remedy these troubles. One of the principal stockholders of the company in talking with me about my friend's report expressed regret that a high-priced engineer should waste his time in looking after such details as unsoldered joints, when any lineman should have found them and applied the remedy. He overlooked the fact that there were dozens of linemen in the service all the time, but none of them had remedied the trouble until some one found it and told them what to do.

The fact that most of our stationed linemen are without telephone experience and most of them with little, if any, experience on inside work of any kind, makes it imperative, it seems to me, that we should employ a certain number of good equipment men. We need not call these men telephone inspectors if we do not wish to, but we might call them telephone instructors. Most of us could use them in that capacity to a good advantage by having them instruct the stationed linemen how to make simple repairs and to teach them how to make tests to determine whether the trouble is in one piece of apparatus or another, or whether it is outside the office. The old way for a stationed lineman to run down a case of trouble in an office was to have the wiring hanging loose so he could run his hand along on the wire and trace it out.

A stationed lineman is usually obtained by promoting a bright young man from one of our line gangs. He has had no experience in hunting line trouble, no experience in wiring offices, and none in locating trouble in equipment. If he has never done any inside work, how is he to know whether his wiring is done right or not? How is he to know whether the equipment is all right if he knows nothing about the equipment? We would not think of putting a man in charge of outside work without having trained him for it. Why, then, should we expect him, or permit him to do inside work without training? I am convinced that these men are entitled to and should be given a course of training in equipment work so they will know as much about the equipment as they do about the outside plant. If this course is pursued, one man can take care of both the inside and outside plant. If this is not done, equipment is sure to suffer at his hands.

Whether we employ stationed linemen to look after the equipment, or employ telephone inspectors to do it, it will be found necessary for inspections to be made at least every thirty days. As stated above, this is necessary to anticipate trouble and clear it before it comes in. If stationed linemen alone are employed, it will be found necessary to employ a certain number of first-class telephone equipment men to clear equipment trouble that linemen are unable to find and to make a general inspection trip at least every three or four months to pick up any irregularities that may creep in due to the stationed linemen not being absolutely familiar with the equipment.

There has been considerable discussion in regard to the advisability of maintaining a repair shop. My experience has been that it does not pay to attempt to rebuild equipment, to rewind coils or to do any repairing that requires any great amount of machinery. I find it cheaper to return to the manufacturers apparatus requiring repairs of this kind and have them do the work. I find it is economical to purchase repair parts for replacement so that the telephone inspectors, or the man in the storeroom can replace the defective parts, such as induction coils, ringer coils, etc. Those roads that are located a great distance from the manufacturers might find it advantageous to do considerable repairing and to provide an up-to-date shop, but it will be necessary for them to go to a considerable expense to equip this shop, and they will have to get a high-grade man to run it.

We have each of our stationed linemen and telephone inspectors send to the wire chief a daily report in duplicate, showing what trouble they have cleared, what work they have done on inspection, and also a report of any installations that they have made. The wire chief checks these against his log book and gets from them any information that he may require. He keeps one copy and forwards the other to the office of the superintendent of telegraph. At the end of each month each wire chief makes up a report, showing the exact amount of each class of material that has been used in each territory on each class of telephone line and sends it to the office of the superintendent, so that it may be reduced to dollars and cents. He also makes out a report, showing the different kinds of trouble that have developed on each class of telephone circuit and what part of the equipment has become defective. At the end of each month each telephone inspector and each stationed lineman who clears telephone equipment troubles fills out a printed form, showing what telephone equipment and material he has on hand. We use this report to check against his daily work report of material used and also to keep us in touch with what each man has so that we can call upon him to ship something to other points if needed, and so that we may know whether or not he has the equipment on hand to make an installation in a hurry if necessary.

The cost of maintenance of different kinds of apparatus is largely what you make it. This cost will, no doubt, vary to a very considerable extent on the various railroads. This is due to several causes. One is that there are a number of different grades of maintenance in use on the different railroads. Another is that some of the railroads have been spending considerable money in experimenting with various kinds of apparatus to determine which is the best and also to help improve the class of apparatus that is for sale. Most of the repair parts are used to replace apparatus broken by carelessness and some of it due to outright abuse. I believe a campaign of education among employes to teach them to handle the telephone equipment properly and to take the right kind of care of it would result in quite a saving.

Telephones Increase in Cuba

Figures have been published showing the growth of the Cuban Telephone Company since a concession for the operation of the system was granted, in September, 1909. A report made by the company shows that January 31, 1914, the company had 16,053 subscribers, as compared with 11,889 on the same date last year, 8,500 in 1912, and less than 4,000 in 1910.

This company now has lines connected with 190 cities and towns. Since the installation of automatic service in Havana in October, 1910, there has been an average monthly increase of 300 subscribers, and this increase is growing larger, as for 1913 the gain in subscribers was more than 4,000.

One of the important factors in the business of the company is the connecting by telephone lines of the many sugar plantations.

The Second Chamber of the States General of Holland has voted the credit for the construction of a telephone cable between the Netherlands and Great Britain.

Unit Costs of Railway Pole Lines

Paper Read Before the Association of Railway Telegraph Superintendents

BY V. T. KISSINGER*

WHEN the idea of applying piecework rates of pay to the construction, reconstruction and repair of railroad pole lines first presented itself, it seemed to offer great possibilities in lessening the cost of labor and in getting more work done within the good working months, if we could overcome the great obstacles which were immediately suggested.

It was finally decided that some labor units were needed for making a schedule; by a series of field observations and simple tests made with different workmen on different pieces of work, a list of some of the more important units was made, and an idea gained of the time consumed in various operations, such as the time used in digging an ordinary four-foot hole, the additional time digging an additional foot, and digging anchor holes of various depths. We figured the cost of holes by labor paid by the day and the number of holes which could be put down in ten hours, without great effort but by steady work on the part of the workmen. Similar figures were made in much the same manner for placing single and double cross arms; also for framing a pole complete, fitting with arm braces, pins and glass. The time used moving from one operation to another was also taken into consideration, as well as the time of the framer distributing his own hardware and glass from handcar or speeder.

At this stage the matter rested until we realized that the only way to handle it was to start actual work, and gain the necessary experience to meet the many problems that arose with intelligent and practical solutions, always keeping in mind the primary object—that this change in method was to lessen the cost of labor without lowering the standard of the work. To get started an experienced foreman and assistant foreman, with a gang of about twelve men, were selected and a timekeeper was added to keep track of the labor units. It was explained to the men that it would be a benefit to them, as well as the company, giving them a chance to earn more wages by extra efforts. It would put the good lively worker ahead of the drone and shirk, and make him a fast and efficient worker. They were asked to co-operate in every way possible to make it a success. However, every man connected with the work was given to understand that any slighting of the work to accomplish greater speed would not be tolerated, and when a hole was found to be short of the required depth, a cross arm not properly placed, or a pole not solidly tamped or sufficiently banked, the man or men responsible for that work would be sent back promptly to correct the defects. It looked full of possibilities to the men and they took a lively interest in the proceedings from the start.

A job rebuilding a pole line with class "D" poles carrying one six-wire arm was the first to be tried by piecework. A schedule of prices was made covering digging holes, setting poles and anchors and framing; the pole setting being pooled. Because of the fact that no one set of figures will apply to more than one estimate, or piece of work, and the necessity at times of making two or more schedules for one section, it would not seem advisable to mention any schedule of general unit prices, because any one schedule of units would not apply generally. It was not expected that the first prices fixed upon would be unchanged throughout the work upon the entire estimate. The intention was to make close and careful observations of every part of the work, get an accurate determination of the labor units, and adjust the prices until they were correct. However, very few changes were found necessary in the first schedule.

It was the duty of the timekeeper to inspect every hole, keep a check upon the number of different operations completed each day, and record each man's earnings for the day. After the work was well started the ingenuity displayed by the men in making plans and devices to save time and to make every move count was remarkable. Shovels and other tools were voluntarily kept sharp and brightened, and everything kept in the best condition possible, to help shorten the operations.

In the earlier estimates it was found that a great deal of "day work" was necessary to take care of the little odd jobs; the cost of the work could not be kept at a minimum until this "day work" was eliminated, and all operations that could possibly be paid for at piecework prices under any conditions, were put under some classified part and covered by a price. Thus additional labor units in connection with setting a pole line were prepared and a fair working knowledge gained of the piecework system as applied to that part of the work.

The next move was to apply the system to transferring wires. It will, of course, be understood that the difference in position of the wires on the new poles from that on the old poles, or setting the new pole in, or too near to, the old pole line, causes a difficult transfer and makes the determination of labor units more complicated. More labor units were found in transferring than in pole setting; some of the less important units were merged into one larger and broader, and the number covered by one price unit. The labor of transferring, levelling up and tying in the wires was pooled, and the total earnings pro-rated and the men paid according to class.

Every piece of work handled under the system has been completed at a considerable saving under the cost of the same kind of work performed by labor paid by the day, yet with an increase in earnings of the men of about twenty-five per cent. Groundmen rated at $2.00 per day have earned a grand average of 26 to 28 cents per hour. Linemen rated at $2.50 per day have averaged 30 to 32 cents per hour.

Through the use of the unit price method, we have been able to reconstruct a section of line 134 miles long, class "E" 20-foot poles, 35 per mile, carrying two bracket wires 110 miles and 3 wires on a six-pin arm 24 miles, at a cost of $26.86 per pole mile for the gang, not including the foreman's salary and expense.

The application of piecework to pole line construction and repairs has not resulted in an inferior standard of work and has not brought about any unfavorable conditions under which the men are asked to work.

We had no occasion to string wire at piecework prices until the system had been fairly established in general construction; consequently there was little difficulty in making up a satisfactory schedule for stringing it.

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Practically, there is but one labor unit represented in this branch of the work, but the conditions which must regulate the prices are as numerous and as complex as are those in transferring, and the same steps were taken in arriving at a satisfactory price.

Several rather extensive repair jobs have been successfully handled as piecework, but its possibilities in that line have not yet been thoroughly determined. In handling repair work under the system the best results were obtained where repairs necessary were uniformly distributed over the line. Where poles are to be generally reset, or arms to be renewed throughout, it can be done easily and economically by the piecework method.

In order to get the best results the work must be completed as gone over. There must be no going back over the line to complete some unfinished task (as is often done on day work) with no account of the extra time consumed and expense involved. The extra supervision necessary to attain this end has been given the work and rigid inspection has brought to light almost every defect. As a result of this, instead of lowering the standard, the quality of the workmanship actually has been improved.

In general, the possibilities of piecework are more far-reaching than was at first apprehended; while it is not claimed that the piecework system so far as we have worked it out is perfect, we know it is a practical method. The fact that reconstruction work was done on level, uniform right-of-way in Nebraska, Iowa and Illinois, where the soil is most favorable, and in the Black Hills country, where it is rough and rocky, with equal success, proved its adaptability. The success of the piecework plan as applied to pole lines, as in all other cases in which it has long been used, is dependent upon the care with which the prices for each unit of work are prepared, close supervision, fairness, and exactness in doing the work.

When a section of line is to be reconstructed a careful inspection of the soil is made, to determine the price to be paid for digging holes, all local conditions affecting the work are carefully noted and a detailed report made covering them. From this report the schedule is made up, and a letter of instruction is issued explaining how to handle any unusual conditions. Copies of this letter of instruction are given to the foreman in charge, timekeeper and each field inspector. In thus settling details and mapping out a line of action in handling the work under a predetermined schedule, we found a distinct advantage over our old method.

To sum up, piecework, as we have found it, is a peculiar problem, governed largely by exigencies, and success depends to a large degree upon supervision and loyal co-operation; it has more than fulfilled our expectations.

Hotel Telephoning

Most of the business of hotels, engagement of rooms and tables, is done by telephone, remarks F. A. Flynn in the *Hotel Gazette*. Courtesy over the telephone is worth money to you.

I do not mean so much courtesy after you have ascertained whom you are talking to, and after you know that it is worth your while to put your best voice forward, but courtesy to unknown voices, to strangers.

It is all a matter of detail. The lack of courtesy is not so much the fault of the telephone operator as the fault of the manager, who neglects to give her instructions, or gives her wrong instructions.

When I call up Hotel Boniface and the operator answers: "Well," or "Yes," or "Hello," I know instantly that something is wrong with the management of the Hotel Boniface.

In answering my call, the operator, instead of saying: "Well," or "Yes," or "Hello," should say: "Hotel Boniface." This relieves me at once of the necessity of inquiring whether I have Hotel Boniface on the wire and impresses me favorably.

If the operator does not know who is talking, she should not give the talker the impression that she thinks he is a tramp; she should treat him as a personal friend of her employer, to whom she owes respect. She should take time and trouble in ascertaining the caller's name and getting it right; should take trouble in ascertaining correctly to whom the caller wishes to talk, and should show an interest in his endeavors to get the connection.

I am convinced that more business is lost to hotels by abrupt or indifferent telephone answers than managers aware of.

The manager should test his operators personally at periodical intervals from distant points, and place himself in the position of a stranger who wishes to secure accommodation or transact other business, just to see how his telephone is handled when he is not around.

Young men are notoriously unable to answer strangers over the telephone in a polite or intelligent manner. Anybody will agree from his own experience that it is bad business to have a young man in charge of the telephone. There are, of course, exceptions, but girls are far preferable, and there are plenty of them.

In engaging your girl operator, do not be satisfied by getting the references from the various hotels where she has worked and then say to her: "Well, with all your experience you must know all about it and won't need any further instructions. You can come to work tomorrow morning at seven." You should take pains to let her know just how you wish her to handle your business and let the personal note of your own character pervade the wires connecting you with the outside world.

Syria to Establish Telephone Connections

It is reported that the government of Lebanon, the head of which is Couyoumjian Pacha, with his seat of government at Babda, Mount Lebanon, is about to establish a number of telephone connections between Babda and some of the more important towns in Lebanon. It is estimated that in all some 150 miles of connections will be made and that 2,000 iron or steel telephone posts will be required. Wooden posts are entirely unsuitable for this country, as they soon perish from dry rot. A European firm has been for some years trying to get a concession for a public telephone service in Beirut, but so far without success. This firm has in the meantime made itself familiar with the subject of telephones, and will no doubt take considerable interest in this new project about to be set in motion by the Pacha of Lebanon.

Railroad Telephone Dispatching Service

Telephones are now in use for train dispatching and for sending messages on the entire line of the Cincinnati, New Orleans & Texas Pacific Railway (Queen & Crescent route), between Chattanooga and Cincinnati, the line between Chattanooga and Oakdale, Tenn., having just been completed and put in service. Work is progressing on a telephone line from Chattanooga, Tenn., to Meridian, Miss., covering the entire line of the Alabama Great Southern Railroad, upon the completion of which the telephone will be used exclusively.

Factors Determining a Reasonable Charge

Presented Before the American Institute of Electrical Engineers

BY PROF. M. E. COOLEY

The paper considers the relations of the public to public service corporations and analyzes the construction and operating costs of the public utility plant upon which the rates for service should be equitably based. The hostility which frequently exists between the public and the officials of such corporations has been due largely to the past attitude of the officials of these corporations, who have frequently ignored the fact that they are doing business under a grant from the public which gives them a practical monopoly of such service, and that they should therefore be restricted to a reasonable amount of profit.

There is considerable ignorance on the part of the public in regard to the total elements of cost which enter into the construction and operation of a public utility plant, and all of these costs must be taken into account in establishing a rate which will give a fair return on the investment and at the same time the best service possible under existing conditions. The various items of expense which make up the total value of the property as a going concern, the cost of operation, depreciation, discount on bonds, etc., are all considered, their total forming the basis upon which the rates for service must be figured.

PROBABLY no question of greater importance confronts our people today than the relations of the public and the public service corporations. I refer to relations of a domestic character, rather than foreign, those which affect us as a nation considered as a family in which the interests of all of its members are, or should be, entwined, interwoven, in such manner that whatever is good for one is good for another.

Naturally in treating my subject I shall have in mind ideals which may require years for their realization, but I shall hope to appeal to you with arguments based so firmly on actual facts that I shall not be accused of being academic. I shall endeavor to throw upon my subject the light of nearly fifteen years of experience in the investigation of public utility properties, and I shall hope to leave with you the impression that my views have been expressed with due regard to proper perspective. That is to say, I shall hope to avoid being accused by anyone of even *appearing* to favor one side of the question as against the other. My desire is to speak of what may be seen from the hilltop by any one who will divorce himself from the interests of either side, and try to look upon the problem with unbiased vision.

There are, of course, two sides to this question, as there must be in order that any question can exist. There is the side of the public and the side of the public service corporation. Today they are wide apart. They are wide apart for one principal reason, namely, ignorance. While it may be no disgrace to be ignorant, it is disgraceful to remain ignorant when so little education is required to dispel it. The education required is not difficult; indeed, it is very simple; but the trouble is that very many of those who most need it are not willing to be educated. Various motives exist, which I will not discuss here, further than to mention that chief among them is a spirit of antagonism, akin to revenge on the part of the public, in localities where the opportunity exists for its manifestation.

It is, I believe, generally considered by the officers of public service corporations that they are, or rather were, themselves responsible for the unfriendly attitude of the public toward them which is now almost general in this country. The public service corporation has in the past proceeded on the theory that the words *public service* had no particular meaning, and that like any other corporation it was at liberty, and indeed had the right, to make as much money as possible out of its business. The public service corporation has in the past ignored the fact that its right to do business is a public grant, a grant which in the very nature of it precluded others from engaging in the same business in the same locality. True, in theory at least, others might be admitted to the field and thus create competition, but practically it has not worked out that way. Ordinarily there is not enough business for two, and even if there were, great inconvenience is likely to result; as for instance in the use of two telephone systems, two waterworks systems, and several street car systems in the same city. It is much to the advantage of the public, both in convenience and expense, to have a single utility of the different kinds serve it when that service can be had on fair terms.

What are fair terms? That is what is partly meant by the words *reasonable charge* in the title of this paper. I say *partly* meant. In the broad sense they may be synonymous. To illustrate: The service rendered by a public service corporation may be very poor without any good excuse for it. In such a case a reasonable charge would be less than when the service was entirely satisfactory. Careless or unintelligent management, or a desire to increase the dividend rate, would lead to this result. Again, the service rendered may be very poor and yet the best possible and keep the business alive; that is, were the rates higher a better service could be rendered. This may be found in small towns where the extent of the business will not support anything better. Further, the service may be very unsatisfactory and still be the best possible to render regardless of rates; that is, physical conditions may limit the ability to render satisfactory service. This may be found in large cities, an example being a street railroad system which can not be extended except by building elevated or underground systems.

Fair terms, then, means fair service, or the best possible under the conditions, to the public on the one hand, and a reasonable charge for that service to the corporation on the other hand. They are, or should be, the two members of an equation which are equal to each other. Like an equation, given the service demanded and certain other factors involved, the fair rate, or the reasonable charge, can be readily determined. It is these factors we come now to consider They embrace, first, the capital investment upon which the interest return is made either in the form of interest or dividends, or both; second, the operating expenses which include maintenance and repairs of all the elements of the physical property, and taxes; third, a depreciation fund out of which can be replaced elements of the physical property which are worn out, or have become obsolete, so that they can no longer be used economically; and fourth, a sinking fund

to provide for the loss of the capital due to depreciation, or the difference between the cost of the property when new and when disposed of at the expiration of its franchise life. Let us take them up in order, capital investment first.

It should be understood at the outset that no capital can be made available for a public utility, or for any other business, for that matter, without a sufficient return on the money to tempt its investment in the business. Capital obeys the law of supply and demand like any commodity. Thus, if capital be invited for investment in a service which is desired by the public, then the public must expect to pay the price in the form of interest or dividends which is necessary to secure it.

However much in the past capital may have been tempted into the field without invitation in the hope of large returns, those days are rapidly disappearing; and before very long, if not now, we shall be obliged, not only to extend an invitation, but to offer inducements to bring capital to our door. Those inducements must be not only a fair return on the capital investment but a welcome guaranteed throughout a term of years. Capital may be compared with the guest in our household. While she bides with us she is entitled to the treatment accorded to a guest. She may have worn out her welcome but at the same time have become indispensable to our domestic affairs, so that we must continue to suffer her presence. We, the public, cannot invite the guest and then while she is with us slap her face; on the other hand, the guest cannot with impunity proceed to rob us once she is in our home.

There is at present a very natural distrust on the part of the public. Capital in the past having very often been self-invited, and having been at first welcome, then tolerated, has finally worn out both welcome and toleration. The logical result, one might think, would be to get along without capital. But, of course, that would be impossible. Whether the utility be built and operated by the public or by a corporation, capital is necessary. It is true that for a municipally owned utility capital may be had on more favorable terms with the security which the public can offer; but it does not follow that the service rendered *would* be at correspondingly low rates or reasonable charges. It *could* perhaps, but the experience of the past favors the belief that such expectation would be utopian rather than practical.

The time is coming, if not already here, when it will make no difference whether capital be invested under the direct security afforded by a municipally owned utility or the more indirect security afforded by a franchise to a corporation. This time will have arrived when the public comes to understand the elements of cost, and all of them, which enter into the construction of a public utility plant. Those elements of cost are the same, or substantially the same, whether the plant be constructed by the public or by the corporation. The public must have a board intrusted with the construction and management of the utility. This board corresponds practically to the corporation's board of directors.

The board, whichever it may be, becomes the agent of the public. It makes the preliminary investigations, employs legal counsel, real estate men to procure the necessary right-of-way, conducts condemnation proceedings, obtains property consents, and attends to all matters connected with the proper launching of the project. It employs engineers to prepare the plans and specifications, invites bids, awards the contracts, and looks after the work during the construction period. It makes arrangements for the necessary funds to finance the project, the necessary working capital, and finally, after the work of construction is completed, puts the plant into operation.

Before its work has been done completely, the business must be thoroughly established; that is, converted from an inanimate to an animate condition. The earnings from operation must as speedily as possible be brought to a point where they will support all of the expenses. During the period of insufficient earnings, the deficits must be cared for. When the earnings become sufficient to meet all expenses, including interest on the cost of the property, the utility may be said to have become fully a *going concern*.

In all of this work the duties of the board or city officials representing the public, or of the officers representing the corporation, have been the same. The elements of costs have been the same. The principles involved have been the same. The only difference has been one of degree on some of the items, as for instance, less difficulty, possibly, in securing rights-of-way, and more favorable terms in financing. But as already stated, these advantages may in the ultimate results be more *apparent* than *real*. That phase I have no intention of discussing in this paper.

The principal cause of the difference of opinion between the public and the public service corporation, as I have come to see it, lies in the failure of the public to comprehend all of the elements of cost entering into the construction of a public utility plant. Not only that, but a failure also to understand all of the elements of expense which must be incurred in operating the property and maintaining its integrity, once the plant has been built and the business established. The corporation itself is only beginning to understand some of these things. Its officers intrusted with the management of the property have been obliged to make the best of things, striving on the one hand to earn the dividends called for by the stockholders, and on the other, to maintain the property so as to give satisfactory service. Without in any way excusing the corporation from its sins of the past, or of the present where they still exist, the trouble is now understood by the corporation, partly at least; and it must be conceded, I think, that just at present the fault lies more with the public than with the corporations. Let us now take up the elements of cost constituting the capital investment.

It will be easier of understanding if individuals will consider themselves a party to the enterprise. Assume, for instance, that you are one of a number of men brought together to consider the building of a public utility property. What is the first step? Naturally you will all want to know whether the project is feasible. This will always involve preliminary investigations, the sounding of public sentiment to know to what extent the proposed service would be demanded, what concessions would have to be obtained in the matter of property consents and the conditions under which a franchise could be obtained. If these inquiries have resulted favorably, the next step would be to employ engineers to look over the field and make preliminary estimates of costs and determine upon the feasibility of the project. With the information thus far accumulated the bankers must be consulted to determine whether the necessary money can be had. At this point the project may fall through, as there may not be a sufficient promise of financial return to induce capital to come into the enterprise.

All of this preliminary investigation has involved

expense which must be borne by someone. It may run from 0.2 to 0.5 per cent of the cost of the proposed property. In case of failure to go further it would fall upon the individuals taking part in the investigation. They have gambled and lost. But should the future promise be great enough to interest capital *mildly*, let us say, then the banker might be induced to gamble a bit, and by being given sufficient odds in the way of discount on bonds and blocks of capital stock depending for their value on future earnings, be induced to come in. The less of gamble there may be, the less the odds demanded by the banks; but at the present time these keepers of the vital life of all business enterprises must, like the well fed trout, have bait of some form on the hook to interest them at all. Not so, however, with the rank and file, who, like the hungry bull-head, bite at anything, even in the dark, if only the light of a candle be exposed to show in the faintest outline the nature of the bait. But public utility properties for the most part are not financed by the rank and file, but by bankers and trust companies. It is, therefore, a real "condition, and not a theory," which confronts the promoter when he seeks to finance a proposition.

If finally the preliminary work has resulted in the determination to proceed, there comes the organization of the company, the employment of legal counsel to draw up the necessary papers, the procuring of franchises, the obtaining of the necessary property consents, the securing of the right-of-way, by purchase or otherwise, the employment of engineers to make the final surveys and prepare the plans and specifications, the bidding and award of contracts. The actual work of construction then begins.

It is at this point that the public conceives the cost of the property to begin; and for the reason that the average citizen, skilled as he may be in the work of his own pursuit, has little or no knowledge of the skill required in another's pursuit. Yet this average citizen must be consulted because the project is a public utility. It furnishes him heat, light and power, transports him to his business, and provides him with other fixed necessities of life. This being so, let the condition be met, and first of all let this average citizen be educated to understand the requirements which must be met if he is to be furnished these necessities of our modern civilization. Once he understands there will not be, so far as he is concerned, any further trouble. The average citizen is fair-minded, and asks for only the square deal.

There is, however, another type of citizen who, however much explaining there may be, persists in seeing things his own way. He may be a self-appointed guardian of the people's interest; sincere enough and honest enough, but too often his zeal results in confusion of understanding, if not perniciousness. Another type belongs to the political class. He sees gain in one form or another if he can keep alive the troubles between the public and the public service corporation.

There is no greater service to be rendered the people of our country today than that which could be rendered by the newspapers if they would but go at this matter with the idea of acquainting their readers with the facts on both sides. I mean that they should not treat the quarrels between the public and public service corporations as items of news merely, but detail men on their staffs to make a study of the question involved, bringing to their aid the skill of the accountant, the engineer, the manager, the public officers entrusted with the affairs of these corporations, the business man, and the man who has devoted a lifetime, it may be, to a study of this class of problems. This work should not be done in a haphazard manner, but systematically and with one object in view, namely, to bring about as speedily as possible a clear understanding of all the facts on both sides. Such a work by our newspapers would not only add to the sum total of our happiness, but promote the prosperity and welfare of the communities which they serve. I sometimes wonder why the proprietors of newspapers do not see that their own business is in the nature of a public utility, morally at least.

It is perhaps unnecessary to refer in detail to all of the different items entering into the cost of the physical property of a public utility. Such items as the following are in general capable of being classified in an inventory, and are readily understood:—Land for railroad rights-of-way, electric transmission lines, and pond flowage; land for the many kinds of buildings required, such as office and station buildings, round houses, car barns, power houses for steam and hydraulic plants; and for reservoirs, dams, waterworks, and gas plants. The buildings themselves, together with their furnishings and fixtures. The roadbed, rails, ties and bridges of a railroad; and the locomotive, passenger and freight equipment. The dam structure, water wheels, and generator of a hydroelectric plant. The boilers, engines and generators of a steam plant. The tunnels and pipe lines of a heating plant. The pumping engines, water mains, hydrants and distribution system of a water works. The machinery, gas holders, and distribution system of a gas works. The conduits, manholes and distribution systems of electric lighting and power plants. The switchboard, machinery and apparatus of a telephone exchange; and the wires, pole lines, conduits and instruments of the distribution system. All of these items, and vastly many more, make up the physical structure of public utility plants. They are tangible, that is, they can be seen, counted, measured, weighed, and their costs determined. Materials and labor are the principal items of their creation and installation.

The plans and specifications of a utility plant having been completed, proposals for its construction are invited. The contractor figures the cost of every item as nearly as possible, adding various percentages to cover contingencies, that is, unforeseen difficulties of construction and oversights, some large and some small. He adds the costs of the necessary permits, the insurance required on the men employed and on the buildings during their construction; and finally adds another percentage on the whole for his profits. The propriety of these percentages in figuring the cost of work in advance is so apparent as to cause wonderment that any question should ever have arisen as to the equal propriety of including them in making an appraisal of a property at any time after it was built. Happily this ignorance concerning many of the physical elements has been dispelled, and there no longer is any question of allowing the necessary percentages to cover contingencies, insurance, contractors' profits, engineering and superintendence.

In amount the contingency percentages, varying on the different things from 2 to 20 per cent and upwards, may be assumed to average not less than 10 per cent. One-half is usually applied directly to the items themselves, the other half as a percentage on the total cost of all the items. Insurance varies from 0.5 to 1 per cent. The contratcor's profit should be estimated at not less than 10 per cent. Engineering and superintendence, like contingencies, varies with the different items from 2 to

10 per cent and over, an average being, say, 5 per cent. One-half is applied directly to the items themselves, the other half as a percentage on the total cost of all the items, including the contingencies and contractor's profits. If the insurance has not been included with the contractor's costs, it should follow after engineering and superintendence, and may then be combined with taxes in a percentage varying from 0.5 to 3.5 per cent. In the application of these percentages, only the *general* engineering percentage should be applied to land, the cost of which embraces its own particular expenses of acquiring, including damages, deeds of transfer and the like.

In case the contract has been awarded to a general contractor he may sublet the different parts to other contractors, each of whom includes in his bid contingencies and other items proper for his particular part of the work and his profits. In such cases the cost of the plant includes, besides the contingencies and profits of the subcontractor, similar items for the general contractor. A general contractor responsible to the owners for the success of all building operations would probably demand and receive not less than 10 per cent of the cost of the entire work covered by his contract; and instances are known where the general contractor's profit has been large, 20 per cent or more. The measure of his profit is usually determined by the nature of the work, that is, the difficulties and uncertainties involved. The building of the Detroit river tunnel is an example of where the general contractor made a large profit; but the uncertainties were such that it was not known in advance whether his profit would be large or small, or whether there would not be an actual loss.

Another method in vogue is to place all building operations in the hands of an engineering firm which makes all surveys, prepares the plans and specifications, and superintends the work from start to finish, making a charge therefor of 10 per cent on the actual cost of the work. This virtually amounts to a profit of 10 per cent, as the cost on which the percentage is based usually includes the salaries and wages of the men employed in the engineering work, and all traveling and office expenses as well. It is known as the "cost plus a percentage" plan. The engineering firm may be likened to the general contractor with this difference: The former takes its percentage on actual costs determined after the work is completed; and the latter on the estimated costs made before the work is begun. Obviously the uncertainties involved would cause the general contractor to guard himself by making liberal estimates.

We come now to discuss certain other expenses chargeable to capital, but which are not so well understood. Taxes during the construction period is an item usually overlooked by the public. Obviously, any real estate acquired by a corporation for public utility purposes would be taxed the same as similar property owned by an individual. Taxes not infrequently are also imposed on structures built, even before any use is actually made of them. One very common error of the public is to assume that if municipally owned there would be no taxes on a public utility property. True, there would be no taxes levied directly against the property, but there would be the indirect taxes which every taxpayer would have to meet. To illustrate: A public service corporation has to pay certain taxes on its property, and they may be very large. If this property be acquired by the city, it bears no taxes. The same amount of money being required to meet the expenses of government, after as before, it follows that the citizens must make up the amount formerly paid by the corporation. If, however, the earnings remain the same, there will be money to pay the taxes out of earnings. But in that case presumably the rates of charges for service would remain the same, so that one of the alleged benefits of public ownership would disappear. The item of taxes is, in an appraisal, frequently combined with insurance, the amount of the item then varying from 0.5 to 3.5 per cent.

The item of organization, administration, and legal expenses usually follows insurance and taxes and precedes interest during construction. As used by some, the term is rather elastic in being made to include all preliminary expenses, costs of promotion, certificates of necessity, mortgage tax, fees of incorporation, securing of franchises, and other general expenses. It is usually expressed as a percentage varying from 2.5 to 5 per cent, being applied to the sum of all preceding costs, including lands.

There arises in connection with many utility projects certain expenses which have come to be known as costs or promotion and promoter's profits. The terms themselves are rather infrequently used in appraisals, these expenses, if considered at all, being included under costs of administration. Administration is frequently combined with organization and legal expenses. Whatever may be said for and against costs of promotion and promoter's profits in the sense that they represent intangible elements in the nature of "rake-offs," there are, in a totally different sense, certain expenditures during both the construction period and the early operative period which are legitimate and necessary and best described as promotion costs. In the sense that a promoter forwards, advances and encourages, that is, contributes to the growth, enlargement and excenllence of a utility project desired by the public, there can be no question that such costs are entitled to consideration in determining a reasonable charge for service.

As to a promoter's profit, its propriety may possibly be decided by considering to what extent one would be willing to contribute to a project, independent of its construction cost, to procure its establishment; or, were a utility now serving the public in some necessary capacity to be taken away, to what extent would you, as one served by it, be willing to contribute rather than lose it. Put it another way: A man says he can make a success of a utility the citizens want, or now have. You doubt its possibility but consent to a trial, and he does it. How much are you willing to compensate him for his energy and brains? This implies a conception free of bias, broad-gaged and just to all interests concerned, which can be had only by being fair and open-minded, and by carefully refraining from reaching any conclusion in advance. Obviously no percentage could be given for promoter's profits, but appraisals in which the costs of promotion have been ascertainable indicate that a proper charge may be as much as 2 per cent. Its allowance must depend on circumstances, and if included as a separate item, it must, of course, be excluded from administration costs.

Interest during the period of construction is an important item often overlooked in the past. This means simply that the money which has been expended from time to time during the progress of the work cannot be had without interest. If borrowed, it is secured by interest-bearing notes; and if provided through the sale of bonds, these bonds bear interest. Ordinarily, the interest charge is based on the assumption that the money expended starts at zero, and mounts uniformly to the total at the end of the construction period. Thus the rate of

interest is applied to one-half the total cost, or one-half the rate is applied to the total cost. The construction period varies with different kinds of property, one year, two years, and three years being common lengths of time. It extends to the time when the property is put into operation and begins to earn. A rate of 6 per cent per annum is usually assumed.

The management of a public utility requires a home for its officers and the necessary furniture and fixtures. These may be rented, in which case the rent becomes an operating expense; or the company may own its offices and furniture and the special fixtures needed for its business. The cost then becomes a capital charge. In large properties, street and steam railways particularly, the offices, furniture and fixtures are frequently items of considerable expense. The cost of the equipment of offices, if incurred at the end of the construction period, does not involve interest during the construction period and the item can follow this interest. If, however, it has come earlier, its cost should enter into the sum on which interest during construction is computed.

Certain necessary stores and supplies must be provided ready for use in emergencies before the property can be put into operation. After the plant has been in operation for a time, these gradually adjust themselves as to quantities of the various items. The money represented by stores and supplies can bear no interest unless it be incorporated in the capital, or be carried as a floating debt. In either case the interest on this money becomes a proper charge against earnings. The amount considered is usually an average taken from the books.

Another item which occasions surprise is working capital. By this is meant the money which must always be available to pay bills, labor and the ordinary expenses of operation, and which in the very nature of the fund cannot bear interest except it be incorporated in capital, or be borne as a floating debt with interest paid out of earnings. In either case it becomes a charge against earnings, and therefore takes part as a factor in determining reasonable rates or charges. As between a capital charge and a floating debt it may be pointed out that as a capital charge the rate of interest would presumably be less than as a floating debt. A working capital is as necessary an expense as any other in the production of a public utility property. Without it the business for which the property was constructed could not be done. How often have we known of the failure of apparently good business enterprises merely for the lack of sufficient working capital. The amount of working capital, like stores and supplies, is usually an average taken from the books.

We have now reached the point at which the property has been completed, having considered items, all of which may enter into the capital investment, and are ready to take up the *second* principal factor, namely, operating expenses. With a working capital to hand, the property has been put into operation. It begins to earn, but a considerable time must elapse ordinarily before the earnings from operations suffice to meet all of the expenditures. By all of the expenditures I mean interest on the cost of construction, taxes, operating expenses, a fund out of which the expenses of maintaining the integrity of the property can be borne, and another fund to provide for losses of capital at the end of the franchise period. These latter I will discuss separately under the head of "Depreciation" and "Sinking Fund," respectively. During this period of insufficient earnings, money must be borrowed to make up deficits; not only that, but interest must be paid on the borrowed money until the time that the earnings suffice to meet all expenses. This accumulated deficit constitutes what may be termed the cost of procuring a going concern; in other words, the cost of establishing the business. Were the property to change hands at the time the earnings just suffice to pay all expenses, the cost of establishing the business would become the going concern value of the property, and be a part of the total value of the property as a going concern *at that time*. It is a difficult element of cost to determine satisfactorily, in the absence of well-kept accounts, starting with the property itself.

Not infrequently the point is made that the longer it takes to establish the business, that is, the greater the sum of its deficits in earlier years, the greater is its value as a going concern. This apparent inconsistency is explained by the fact that these deficits are real costs, and necessary if the utility is to be had at all. The utility being a necessity, it must be supported by the public the same as any other necessity. The cost of establishing the business therefore becomes a factor in determining reasonable rates or charges. This cost, like that of working capital, if incorporated in the interest-bearing capital, becomes less of a burden against earnings than if carried as a floating debt.

Probably the least understood factor of expense in connection with a public utility property is depreciation. I have called this the *third* factor in determining a reasonable charge for public utility service. By depreciation I mean the money required to be paid out of earnings in order to meet the expenses of maintaining the integrity of the property. Depreciation is the result of wear and tear and exposure to the eleemnts. It also includes the replacement of machinery which, while not yet worn out, has become obsolete; that is, no longer economical to use; or if still economical, no longer satisfactory to the public. Depreciation includes, further, the wrecking of the machinery due to accident, or to the acts of God.

In the building of a public utility property all of the elements are originally new, but as time goes on these elements suffer wear or decay, some in one degree, some in another. When an element has become worn to a point where it is no longer profitable to keep it in service, it is replaced. Thus in time we have a property which as a whole is made up of old and new elements, the condition of which in the aggregate is something less than the first cost of these elements new. In the very nature of the property it is impossible ever after it is once started to have present in it the full 100 per cent represented by all new elements. It can, however, be maintained in some condition less than 100 per cent, and it is usual and necessary to maintain it at a point which will enable the most satisfactory service to be rendered with the smallest expense consistent with satisfactory service. This point may be anywhere between 80 and 90 per cent, depending on the kind of property.

The expense necessary to keep an element in service during its useful life is a plain operating expense classed under maintenance and repairs, and is not included under depreciation as I am describing it. The depreciation fund is properly a separate fund, maintained as such as distinctly as an interest fund. It is the fund which insures the prolongation of the life of the property indefinitely and always in a condition to render satisfactory service. It is not, however, a fund out of which additions, extensions or betterments may be made, which in their nature constitute additions to capital.

Thus understood, depreciation becomes a factor, and,

indeed, a very important factor in determining reasonable charges for public utility service. Unhappily, the practice of providing this fund is not uniform with the different utilities—not uniform either in principle or practice. It has long been common for some utilities, railroads, for instance, to wear down in lean years and build up in fat years. Thus the condition of the property is not maintained in some uniform condition expressed as a definite percentage of the cost of all new elements, as, for example, 80 per cent, but may vary all the way from 75 to 85 per cent.

It is commonly believed by the public that a utility property should not be permitted to earn on more than the so-called present value of its physical elements; that is, their cost new less depreciation, say 80 per cent of the cost new, or less. As bearing on this I have pointed out that the property, which by means of a proper depreciation fund can be maintained at some definite percentage which enables it to render satisfactory service, has cost 100 per cent. That is, the 80 per cent property can not be had at all without expending the 100 per cent. Thus in order to have an 80 per cent physical condition, we must have a capital charge of 100 per cent. From this it becomes apparent that in determining a reasonable charge we must base it not on the percentage which represents condition, but on the cost of the property which cannot be maintained economically above an 80 per cent condition.

If, however, it be insisted that only that percentage of the total cost which is represented by the maintained condition of the property can bear an interest return, the loss of capital and interest thus incurred must be provided for out of earnings in another way, namely, by a sinking fund. This, then, is the *fourth* factor determining a reasonable charge for public utility service. It is to be borne in mind that in this entire discussion I am assuming only actual costs in the capital investment, and only such an interest rate as will induce the investment of the capital in the utility. At the end of the franchise period it is necessary to make good both principal and interest.

The importance of this sinking fund and its magnitude depend on the attitude of the public towards the utility company. The public service corporation works under a franchise, which is simply a grant by the public of the right to do business. With certain kinds of utilities the franchise is perpetual, with others the life is limited to a definite period, say 30 years. In some states, Wisconsin, for instance, indeterminate franchises are granted; that is, franchises which can be called in, or surrendered, at any time, subject to control by the railroad commission of that state. In the case of a limited franchise under which the utility company must cease operations and close up its business at the end of a definite period, the company must make not only enough to pay the interest on the cost of the plant and maintain it always in condition to render the service demanded by the public, as well as the operating expenses, including taxes, insurance and repairs, but also an additional amount to cover whatever part of the plant must be sacrificed at the end. This means a sinking fund to retire portions of the cost, if not the entire cost. In other words, the company must earn enough during its life to pay back whatever part of the principal has to be sacrificed, as well as the interest on the principal, in addition to maintaining and operating the plant satisfactorily during its franchise life.

This sinking fund is not always, indeed, I may say, is not generally, kept as a separate account, in this country; but is taken out in the form of distributed earnings from year to year in excess of the amount normally required as interest on the cost. Not infrequently what appears as an abnormally large dividend will on analysis be found to be only sufficient in the end to make good to the investor both the interest on his money and the principal sacrificed when the business is closed out.

It should be clear from this that in general a long term franchise is more favorable to the public, so far as charges for service are concerned, than a short term. To illustrate: assume that the plant must be sold for what it will bring as scrap or second-hand material; the difference between its cost and sale value must be made up out of earnings during the life of the franchise. Thus, if the franchise life be short, say 25 years, the sinking fund annuity must be much larger than if the life be 50 years. No annuity is required when the life is perpetual. No doubt longer term franchises will be granted in the future, particularly now that the control of them is being lodged by the states in public service commissions.

I am not discussing in this paper conditions which have existed in the past, or may exist, now, in connection with old properties, but am confining myself to fundamental things, those which should guide us in our future relations; those relations which will come to exist when the public service corporation is permitted to earn only enough on its investment to bring capital into the field; that is, the critical condition, as it were.

There remains for me only one more topic, and this I have put off until the last, always shying at it, and going around when possible. I refer to discounts and securities. This I have found: No bond house will even consider financing a public service corporation without a bond discount. I refer particularly to utilities built and operated under a limited franchise. It will have to be a good property to secure better than 15 per cent discount. It is an excellent property which commands as low as 10 per cent discount. The best discount I have ever come across in my own investigations is 8 per cent. This does not apply to municipalities, however, at least not to the same extent.

The simple conclusion is that if the public utility is a necessity and the money for it is obtained in the usual way, one element of cost is the discount on the bonds, which in effect starts the property off with some water in its securities. It is, or is not, water, as you view it. Anyhow, it is necessary in the ordinary way of financing properties. Thus we are obliged, in determining a reasonable charge for public utility service, to consider not merely the actual cost as I have previously given it, but something more, namely, the face of the securities which command an interest return. Opinions differ on whether it is better for this discount to be absorbed as a capital charge or carried as an inteerst charge. So far as the purpose of this paper is concerned it is not material, as in either case there must be a charge against earnings to take care of the discount.

It will be convenient to bring together the several elements which take part in determining a reasonable charge for public utility service. Not all of them take part at the same time, necessarily, for some may appear in one case and not in another; or several may be combined in a single item. In a general way and in a somewhat natural order, they may be summarized as follows:

First, Capital Investment.—1. Preliminary cost covering investigations as to feasibility of project.

[Note.—Organization, promotion, administration, and legal expenses, engineering and superintendence during construction, which are distributed over the whole period of construction, are more conveniently placed later in the schedule.]

2. The physical property; the several items making up the whole arranged in order, each affected with its proper allowances to cover contingencies, special engineering, and other costs peculiar to the item; land first, followed by clearing and grubbing, then the various structures and equipment; sub-constractors' profits included with separate items.

3. General contingencies applicable to the property as a whole as distinguished from special contingencies applicable to particular items.

4. General contractors' profits; or, the profits to an engineering firm building the property on the "cost plus a percentage" plan.

5. General engineering, and superintendence during construction.

6. Insurance and taxes.

7. Organization, administration, and legal expenses.

8. Cost of promotion, and promoter's profits.

9. Interest during the construction period.

10. Office furniture and fixtures.

11. Stores and supplies.

12. Working capital.

Second, Operating Expenses.—13. Operating expenses *per se*; that is, salaries, wages, fuel and other supplies, reapirs and upkeep; all expenditures required in rendering the service of the utility, including insurance and taxes.

14. Interest on the capital investment (the actual cost of the property), *i. e.*, interest on securities which must be paid regularly.

15. Interest on floating debts; this may include the discount on bonds, and the cost of financing, if these have not been incorporated with capital.

16. Cost of establishing the business; the sums of money required to be borrowed, with interest on the same, to make good the differences between the earnings and expenditures up to the time the earnings become sufficient to meet all expenditures. This may be made a capital charge, or carried as a floating debt to be paid out of future earnings.

Third, Depreciation Fund.—17. The regular contribution to the depreciation fund, out of which the integrity of the property is to be maintained.

Fourth, Sinking Fund.—18. The annuity required to retire such portions of the securities as may be necessary at the expiration of the franchise life of the property, in order that the investor may receive back his entire principal when the business is closed out.

It will surprise everyone not familiar with the cost of building utility plants to learn that the so-called overhead charges are in the aggregate a large percentage of the costs of labor and the material things entering into their construction. An examination of the various percentages mentioned in discussing the elements of cost, omitting items 1, 4, 8, 15 and 16, will disclose that if the individual contingencies of construction, special engineering charges, and contractor's profits be assumed to be embraced in item 2, the total percentage may vary from 12 to 25 per cent; and if these inside percentages be added to the outside, or general, percentages, the total percentage may vary from 30 to 60 per cent.

It is to be regretted that engineers, and others who have had experience in building properties, and valuing them afterwards, have not done more towards disseminating knowledge of the actual conditions found in such work. We should then be much further along towards the mutual understanding which must exist before the public and the public service corporation can get together on common ground. But engineers have many times hesitated to use the larger percentages, fearing to be accused of favoring the corporation. They have preferred instead to secure the equivalent of them by using larger units of costs; or have used the smaller percentages, influenced by the feeling, unconsciously perhaps, that all things considered, the results were fair enough. In combining the judicial with their engineering function, they have unwittingly only obscured the issue. All too frequently engineers have felt obliged to exert themselves to the utmost in favor of their client, leaving the interests of the other side to be fought for with equal solicitude by an opposing engineer. Thus they have become advocates. This, in my opinion, is not the best way to handle these momentous problems. It would be far better in these troublesome times to throw open the blinds and let in the light, our motto being *veritas vincat*.

Progress in England

Far-reaching developments of the telephone system in Great Britain will be carried out during the course of the next year or so, according to the London *Electrician*. From the experience gained at the automatic exchanges now in operation at Epsom and the general post office (London), the post office telephone engineers feel justified in equipping ten additional exchanges with automatic apparatus. The towns selected for these exchanges are Darlington, Newport (Mon.), Grimsby, Portsmouth, Leeds, Dudley, Paisley, Chepstow, Stockport and Accrington; and it is probable that the exchanges at Manchester, Liverpool and Newcastle will also be gradually adapted for the installation of the automatic system. This may be done by using a semi-automatic system, by means of which the operator will simply tap the number required on a dial instead of the present method of plugging and ringing up. It is estimated that the installation of this system will increase threefold the number of calls possible per hour. News also comes to hand that the Second Chamber of the States General, sitting at the Hague, has voted the credit for the construction of a telephone cable between the Netherlands and Great Britain. Direct telephonic communication between London and Switzerland is expected to be opened in a month or two's time; the necessary agreement has already been signed by the British and French governments, and it is expected to be signed on behalf of Switzerland at an early date. No technical difficulty is anticipated by reason of the new type of loaded cable, which was laid between Dover and Calais last year. Experimental conversations between London and Berlin are of almost daily occurrence, although the results so far have not been uniformly successful. The lines run via Dover, Ostend, Brussels and Cologne, a distance of nearly 700 miles. The tremendous development of the telephone service in Berlin is demonstrated by the new estimates for the German Imperial Post which include provisions for the appointment of 7,700 more operators. It is stated that the number of subscribers is increasing at the rate of 100,000 every year.

Possible Change in System in Milan

For some time there has been great complaint among subscribers and business men of Milan, Italy, over the telephone service, the great criticism being that the equipment is old and that the business is not systematized sufficiently to handle the large amount of daily business. In a meeting of the business men of the city on April 28, the situation was discussed at length and a letter from the ministry was read, offering the following plan for the betterment of the service:

There should be six zones established, each to cover a circle that would be nearly 6 kilometers (kilometer= 0.62 mile) in diameter. In these zones there should be a central office, each of which would be connected with the other five zones. The zones would be, first, the central, the same as at present, and covering the important business section; the others located in the parts of the city known as Porta Venezia, Porta Volta, Porta Magenta, Porta Ticinese, and Porta Romana.

For the zones of Porta Ticinese and Porta Venezia, those which are most urgent, the quarters are already leased; and there is in the course of approval by the government a contract amounting to more than $154,400 with the Societa Pirelli for equipping and laying the cables destined to form the network connecting the subscribers of the two zones; while the street work, amounting to $18,335, would be executed by the city. With this work the net of Porta Venezia, which it is believed the firm ought to complete in about nine months after the approval of the contract, would be apportioned 4,400 pairs of wire, and that of Porta Ticinese, which would be completed within thirteen months if a contract were granted by the state, would have 2,950 pairs; together 7,350 pairs of wires, which would be an important reinforcement to the present network in that section. The work of the other three zones would follow the completion of those mentioned; and provision would be made so that all zones could be subdivided later on if necessary.

In the discussion it was pointed out that under the present system, of the 13,800 subscribers, 10,000 are connected with the central office in the Piazza Cordusio, and the remainder with the subcentral station; and, moreover, that under the present system only about 14,000 subscribers can possibly be served, whereas under the new system, as planned, the number could be increased to about 60,000. It is believed by the more conservative element in the city, however, that it will be considerable time yet before the government will grant Milan the new telephone system and actually commence upon the planned improvements.

Blind Man Handles Telephone Exchange

Several private telephone exchanges in the eastern part of Oklahoma are operated by blind men, who perform the work as rapidly and unerringly as men with perfect vision. But McCurtain has a telephone exchange that is operated by a blind man who also attends to all of the other work of the exchange.

T. M. Warrell, 35 years of age, who has been blind since he was 2 years of age, is a half owner of the McCurtain exchange and attends to all of the outside work of the exchange. He is relief and night operator of the system. He keeps his own books, using the New York point system, which he learned in the school for blind in Little Rock, Ark., where he spent eight years of his boyhood.

In addition to keeping the books and acting as telephone operator, Mr. Warrell installs his own telephones, strings the wires, clears trouble on the lines and instruments and does all of the work ordinarily done by linemen with perfect vision.

In operating the switchboard Mr. Warrell can answer and complete the calls as quickly as though he could see. He clears the switchboard of trouble by first testing and locating the wires as nearly as possible. Then he follows the wires with his hand until the broken part is found and connected.

If the lines are crossed from the outside Mr. Warrell enlists the services of a small boy. True to small boy nature, there is always some youngster willing and ready to help the blind man and trace the trouble until the youngster sees where the wires are crossed. Mr. Warrell then puts on his lineman's belt and spurs, climbs the pole and quickly clears the trouble.

The blind man has less complaint from the patrons of the exchange than many men who can see to operate a switchboard have. He is prompt and accurate and has a natural bent toward electricity and a love for his work, and he has never asked any favors because of his affliction.

Texas School Will Teach Telephony

Among the innovations in an instructional way that are being planned for the session beginning September 22 at the A. & M. College, College Station, Texas, is a one-year short course in telephony. Prof. F. C. Bolton of the department of electrical engineering has just completed the arrangements for this course.

The course in telephony is intended for the young man who wishes to make an intense theoretical and practical study of the equipment used in telephony. The course begins with a study of the principles of electricity and magnetism, including such principles of alternating currents as are directly applicable to telephony. The various parts of the telephone, the distributing frames and switchboards will be studied. A detailed study of the principles of the design of a plant, the methods of testing, methods of testing circuits will be made, and instruction given on all problems which are met in telephony.

Lectures by experts from the commercial field will augment the regular courses of study.

To Test Nebraska Depot Telephone Law

A suit by the Nebraska Railway Commission to compel the Missouri Pacific Railroad Company to install a telephone in its depot at Hallam, which has slumbered on the district court dockets since the time of its filing in 1910, was reinstated by stipulation of the parties June 20.

The suit was dropped at one time for want of prosecution. It is said that its reinstatement is at the request of the railroad company, which wants to test out the statute of 1909, compelling common carriers to furnish telephonic accommodations at depots.

The original answer of the company contains the contention that the statute is unconstitutional, being contrary to the constitutions of both the state and the United States.

If the world does not recognize your talents, don't get discouraged; get mad. An angry man sometimes accomplishes something; a discouraged one never does.

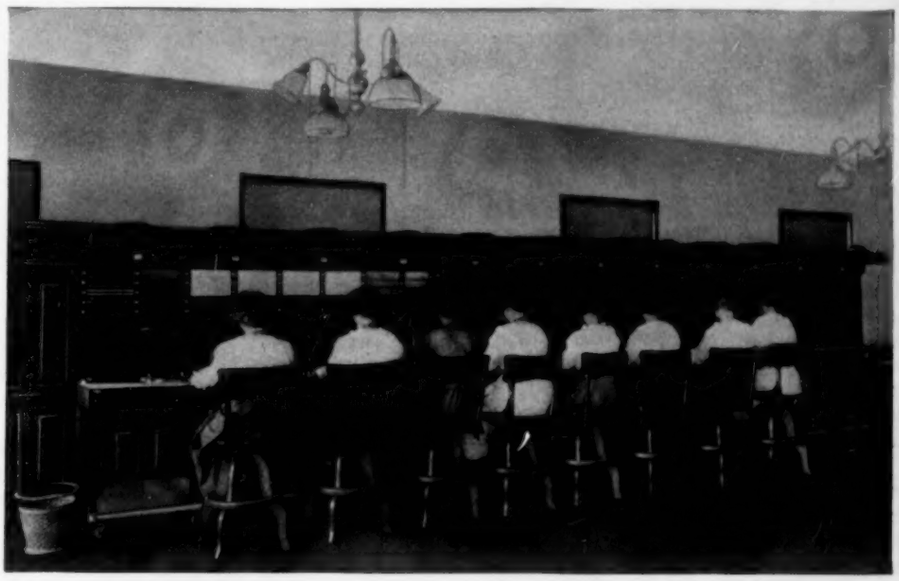
Of Interest to the Trade

What the Telephone and Accessory Manufacturers Are Doing to Advance the Art

Rock County Exchange at Janesville, Wis.

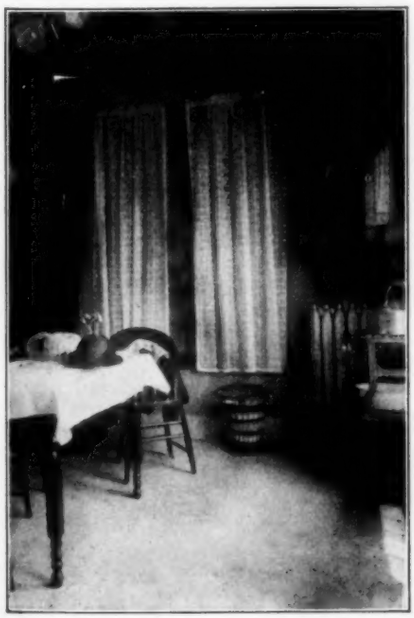
Efficient—that describes the Rock County Telephone Company's Janesville plant. The building itself looks efficient, and casual inspection shows that it is so. Standing in the center of this progressive town, that clusters around the reaches of the beautiful Rock River, this independent plant expresses all that is up-to-date in telephone service. Situated on a hundred foot lot with heavy stone foundation, built of tan finish pressed brick, two good stories high, with large windows on all sides, the kind which really illuminate an interior and are not built for decorative purposes—so much for the Janesville Telephone building, as seen by the approaching visitor.

The switchboard room, which is, of course, the vital part of any telephone exchange, is *the* room in this plant. Forty-three feet long and thirty-two feet wide, with enough space at the back for any switchboard man to work in, and a large airy floor, a room in itself in front of the board—no operator would think of asking for better working conditions.



View of the Rock County Telephone Company's Well Lighted, Well Ventilated Exchange Room.

Next in importance, perhaps, so far as business efficiency goes, is the arrangement of the telephone office, and here we have a large well-lighted room in the front of the building, with the executives' desks in separate offices on one side, the bookkeeping department at the back with ample space for complete card indexes of subscribers and city records. A large, old-fashioned fireplace on the north side of the room gives a touch of informality that is pleasing. A wide concrete main entrance leads to a subscribers' counter and cashier's window with a telephone booth nearby for the use of the public.



Corner of Completely Equipped Kitchen for Operators' Use.

The terminal room, like every other department of the building, is in spick-and-span order and has an especially convenient arrangement of racks, pole changer apparatus, power panel, rectifier, and the wire chief's desk. There is room to get all around the frame without crowding, a condition not often met with in the medium sized exchange.

The operators' rest room and lunch and wardrobe facilities are attractive, the girls entering and leaving by a side entrance which connects direct with the operating room.

In the basement is a large tiled battery room adjoining the supply department. This, Mr. Willitz said, is the only part of the exchange that has not been put in perfect order. Even at that, the stock in this supply room is stored in orderly appearing shelves and bins.

The magnificent switchboard of quarter-sawed oak, built complete by the Kellogg Switchboard & Supply Company, consists of four common battery multiple sections, line lamp signals throughout with two supervisory lamps in each cord circuit. The multiple and answering jacks are of the two-wire bridging type, having no series contacts, and the subscribers' cord circuits are of the two-wire type, arranged for automatic ringing and secret service. This feature Mr. Willitz recently commented on as follows:

"So far, this equipment is very satisfactory, especially the automatic ringing, which we consider one of the most important improvements in the telephone field in years."

The line and talking circuits are strictly metallic and perfectly balanced for all operating conditions. Also,

they are arranged so as to produce no cross talk or other inductive disturbances.

The capacity of this exchange is for the present 1,400 lines, with an ultimate of 2,000 lines, although the switchboard sections are large enough to accommodate multiple jacks for 3,000 lines, multiplied every six panels.

The toll position is equipped with wiring for twenty and equipment for ten drops and jacks for toll lines, with wiring and equipment for ten recording trunks. All operators' sets are breast plate transmitters. The operator's switching key is so arranged that two operators cannot be connected together in such a way that they can converse.

In the toll position there is one line pilot and supervisory pilot with eight combined toll to toll and toll to local cord circuits, double lamp supervision, combined ringing and listening key, double cut-off key, combined ring-back and switching key.

The position for rural lines contains wiring for sixty and equipment for fifty with 500 ohm drops and jacks. There is wiring and equipment for twenty recording trunks; fifteen toll to local and toll to toll cord circuits with automatic ringing on local, manual ringing on toll lines; double lamp supervision, with combined ringing and listening key and switching key. The repeating coil is connected in the circuit permanently.

The remaining positions of the board are each equipped with 200 answering jacks and lamps for common battery lines, seventeen cord circuits, four party automatic ringing and listening.

All common battery lines terminating in this board are multipled every six panels, 1,200 multiple jacks located in each of the three sections, and 400 additional in the third section for double-back, making a total of 4,000 multiple jacks.

There are sixty multiple jacks for recording trunks. A very attractive chief operator's sanitary type turret top desk is furnished. The chief operator's desk eqiupment is interesting, all circuits terminating in keys and

Chief Operator at Sanitary Type Desk.

lamps. There are eleven monitor's taps wired, with eight equipped, eleven line pilots, eleven listening-in taps, eleven supervisory pilot taps and three service taps. There are two lines to the local board, two-way, two trunks to the local board, ending in a plug and lamp at the first position on the local board, and in a key and lamp at the desk, two lines to the wire chief's desk.

The wire chief's desk has two lines to the local board, wired to the main distributing frame, and connected to regular lines. Two wires to the chief operator's desk, two testing trunks to local switchboard, for common battery lines, one testing trunk for rural lines, one testing trunk for main distributing frame, one wire chief's telephone set, with suspended type transmitter.

The testing circuit has eleven keys and flush type round pattern Weston voltmeter, for making all necessary tests.

The main distributing frame is of the Cook type, designed so that additions can be made.

The power equipment operates from 110 volts, 60 cycles, single phase. The present battery equipment operates 1,200 lines for a period of 48 hours, and when

Operators' Rest Room; Cheery, Light and Well Furnished.

the capacity of the batteries is increased to thirty ampere hours, will operate when equipped with 1,800 common battery lines for a period of 48 hours. The equipment consists of two sets of eleven sets of storage battery, one mercury arc rectifier, and 12 circuit motor driven interrupter machine to operate from 110 volts, sixty cycles, alternating current. One motor driven interrupter to operate from 24 volts, direct current one pole changer test and 2 four frequency pole changer sets with transformers.

A neat and practical power switchboard completes this part of the equipment.

It is constructed of the best grade of Monson slate provided with copper switches of ample size and capacity, conveniently arranged and connected to meet all demands and quick changes.

The cut-over from the old magnetic board, according to Mr. Willitz, superintendent, although difficult, was interesting. With the old equipment at peak load 13 operators or more were required. Now eight operators take care of the traffic easily. Formerly a hundred lines were handled by one operator. Now 200 lines are taken care of promptly and efficiently.

Mr. Willitz also stated last week that when the construction is complete and running normally he expects to use just half the number of operators which were used with the old equipment.

The building and grounds of this magnificent plant of the Rock County Telephone Company cost approximately $70,000. The present officers are: H. D. Farnsworth, president; H. D. Murdock, treasurer; Richard Valentine, secretary and general manager, and H. C. Willitz, superintendent.

Some men knock all advertising because they did not get results from a one-dollar ad; but then some men go fishing with angleworms for bait and swear there is nothing but bullheads in the pond.

National Foreign Trade Council

The National Foreign Trade Council, consisting of thirty men of national prominence, truly representative of the industrial, commercial, transportation and financial interests, is being organized in accordance with the mandate of the National Foreign Trade Convention, held at Washington on May 27 and 28. It began a systematic and aggressive campaign for extension of American foreign trade. W. C. Redfield, secretary of commerce, said to the five hundred delegates representing one hundred commercial and industrial organizations, "If there is one thing European manufacturers dread as regards the future of their own business it is that America shall awake to her privilege and her power in foreign trade."

The convention promptly created the National Foreign Trade Council to do the awakening. It is industrial America's answer to the highly energized campaigns with which European nations conquer foreign markets. The convention unanimously adopted a resolution declaring it "essential to the best interests of the nation that the government and the industrial, commercial, transportation and financial interests should co-operate in an endeavor to extend our foreign trade." The president of the convention, Alba B. Johnson of Philadelphia, is also president of the Baldwin Locomotive Works. The council is directed to call another convention at a suitable time and place and to seek the co-operation of the Chamber of Commerce of the United States of America.

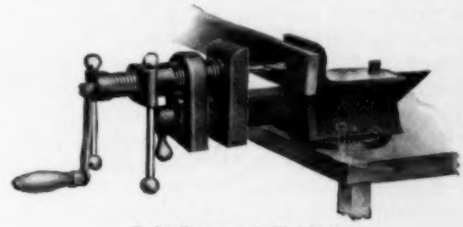
The administration's attitude was revealed by President Wilson's expression of a desire to have further conferences with the delegates and Secretary Bryan's speech telling them the State Department would endeavor to open all doors and protect every legitimate right that an American has wherever he goes.

The movement sprang from a realization by industrial leaders that prosperity largely depends upon increased export trade now that the new tariff has precipitated American manufacturers into world competition. The foreign trade of the United States last year was valued at more than four and one-half billion dollars, but those engaged in it feel a lack of co-ordination of the nation's foreign trade activities. Among the men behind the new movement are: Cyrus H. McCormick, president of the International Harvester Corporation; Lloyd C. Griscom, former minister to Japan and ambassador to Italy; James A. Farrell, president of the United States Steel Corporation; Edward N. Hurley, vice-president of the Illinois Manufacturers' Association; P. A. S. Franklin, vice-president of the International Mercantile Marine; Waldo H. Marshall, president and Charles H. Muchnic, foreign manager, of the American Locomotive Company; Eugene P. Thomas, president of the United States Steel Products Company; Charles E. Jennings, president and E. V. Douglass, secretary, of the American Manufacturers' Export Association; Charles A. Schieren, Jr., president of Chas. A. Schieren & Co. of New York; Captain Ellison A. Smyth, president of the South Carolina Cotton Manufacturers' Association; E. A. S. Clarke, president of the Lackawanna Steel Company; Edward C. Simmons of St. Louis; Willard Straight, president and John Foord, secretary, of the American Asiatic Association; and Henry White, president and Frederic Brown, secretary, of the Pan-American Society. Their slogan is "greater prosperity through greater foreign trade."

Standard Underground Cable Company's new series of bulletins and booklets about cable and wire will interest telephone men who care to send for them.

Trident Combination Drill-Press and Vise

Illustrated here is the new "Trident" drill-press combination and multi-vise, manufactured by the Diamond Expansion Bolt Company, 90 West street, New York. This is a combination of several useful tools in one—a vise, an anvil with cutting hardy and a drill-press, all placed upon a swivel base. It is claimed to be the only tool on the market of this character in which the work can be securely held between the jaws of the vise while it is being drilled by the drill-press, the two actions being independent of each other. The drill-press is detachable so that it can be instantly removed when not



Drill Press and Multi-Vise.

required for use, with the vise and anvil always ready for service. The drilling arrangement is equipped to take all sizes of the ordinary small tapered square shank drills for drilling metals or wood, and also the large square tapered shank drills for heavy duty metal drilling. Another important advantage is the quick releasing action similar to that used on the large expensive lathes, permitting the drill to be drawn from the hole by a quick sliding movement, making it unnecessary to unscrew the feed screw. The entire tool can be quickly removed from the work-bench, wagon or other support by simply releasing the nut from the swivel bolt. The complete tool weighs about 60 pounds, but costs hardly more than an ordinary vise, considerably less than a drill press, and far less than even the smallest lathe, still it does some of the work of all, and besides has a fine anvil and tool steel cutting hardy. The Diamond Expansion Bolt Company has issued a new circular fully describing the unusual advantages, which it will gladly forward upon request.

Automatic Successful in India

The following extract from the *Daily Consular and Trade Reports* of recent date refers to the automatic telephone system installed in Simla, India, for the Indian Government by the Automatic Telephone Manufacturing Company, Ltd., of Liverpool and London, which manufactures this equipment under Automatic Electric Company's patents, and has exclusive sales rights in Great Britain, some of the British possessions and certain other foreign countries. The report is from Henry D. Baker, American consul at Bombay, India, and reads as follows:

In my report, "Business of Indian Telegraph Department," in the *Daily Consular and Trade Reports* for January 27, 1914, it was mentioned that an automatic telephone system under American patents was soon to be installed and tried at Simla, the summer capital of the Indian empire.

The installation of this system at Simla has been completed and at the commencement of the season there in April was being worked with results apparently very pleasing to all concerned. The following appears in a telegraphic item from Simla, published in the *Advocate of India*, at Bombay, dated April 21, 1914:

"Remarkable results are being obtained with the automatic telephone introduced this season for the first time at Simla. The new system has already become so popular that enough additional subscribers have come in to pay a consid-

erable portion of the interest and sinking fund charges on the capital expended in making the change, and taking the saving effect in telephone operator's pay into account, the experiment must be considered not only as paying its way, but as promising to be a source of profit to the telegraph department. Under these circumstances, in view of the very great convenience the automatic affords, the question of extending its use to other stations is being taken up, and it is understood that an experiment, similar to the one at Simla, will be tried in one of the smaller plain stations, with a view to ascertaining whether the system will work as well in heat as it is doing in the cooler climates of the hills."

Branch Offices of Bureau of Commerce

Branch offices of the Bureau of Foreign and Domestic Commerce have been opened in New York, Chicago, New Orleans and San Francisco, where the bureau's publications, samples of foreign-made products, plans and specifications of construction work abroad, list of foreign dealers in various lines, manuscript consular reports, and similar documents are available to interested individuals and firms. Reserved addresses in connection with "Foreign Trade Opportunities" published in the *Daily Consular and Trade Reports* may be obtained by application in letter form from these offices. It is suggested that firms in the districts served by these branch offices acquaint themselves with the material available through them, as time may frequently be saved by application to the branch office instead of the Bureau at Washington.

The addresses of the branch offices are as follows:
New York, Room 315, United States Custom House.
Chicago, 629 Federal Building.
New Orleans, Association of Commerce Building.
San Francisco, 310 United States Custom House.

Australian Automatic Exchange to Enlarge

A 500-line addition for the Geelong, Victoria, automatic exchange has been ordered by the Australian government through Automatic Telephones (Australasia), Ltd., sales agents in that country for Automatic Electric Company of Chicago. The Geelong system was the first automatic installation in the commonwealth, and was cut in service two years ago. It has given entire satisfaction both to the government engineers in charge of its operation, and to the subscribers. The original installation comprised 1,100 lines, and it was believed at the time of the cut over that this capacity would be sufficient to meet all demands during the five years, 1912 to 1916. But after only two years of that period have passed, it is necessary to enlarge the plant more than 45 per cent.

Two new automatic exchanges in Australia have been cut into service recently, one being the 2,000-line Newtown installation, in the Sydney area, and the other the 1,500-line system at Brighton, in the Melbourne area. Cable advices received by Automatic Electric Company state that in both cases the change from manual to automatic was made without difficulty and that the new plants are operating satisfactorily.

Automatic for Port Arthur, Sask.

A 1,225-line (immediate capacity) full automatic telephone system has been ordered by the provincial government for the city of Port Arthur, Saskatchewan, from the Automatic Telephone Manufacturing Company of Canada, Ltd., a branch of the Automatic Electric Company of Chicago. The exchange will be of the 10,000 type. This is the seventh city in this section of the Dominion to adopt this type of equipment.

The 2,000-line automatic exchange ordered for Medicine Hat, Canada, is now in course of installation, and will be cut into service within a short time.

International Motor Affairs

As considerable publicity was given last fall to a suit brought by George E. Blakeslee against International Motor Company, et al., the company has issued a statement from its office to the effect that on May 14, 1914, Justice Manning handed down a decision which appears effectively to end the litigation.

Justice Manning in dismissing the complaint against International Motor Company, because no facts were shown sufficient to constitute a cause of action against International Motor Company, remarks as follows concerning Mr. Blakeslee:

His status as a stockholder of the International Motor Company gives him no special privilege not enjoyed by other holders of its shares, and his charges against the latter company fail far short of an actionable complaint for the abuse of fiduciary powers on the part of officers and directors of the International Motor Company. The rights of others are to be conserved and preserved, as well as those of the plaintiff, and courts are not prone to attempt the settlement of business policies in the management of corporations except where fraud and gross dereliction of duty is clearly charged and susceptible of proof.

The company feels gratified over the satisfactory and conclusive action of the court.

Stromberg Dividend

Another step in the reorganization of the Stromberg-Carlson Telephone Manufacturing Company was taken by the directors at a meeting, June 12, when they declared a final liquidation dividend of $5 per share on the preferred stock, payable June 22, to stockholders of record at the close of business June 16.

The directors also decided to sell the property of the company at public auction June 30, bidding it in for use by the company. If the directors are the successful bidders, as expected, the property will be transferred immediately to a new corporation, having the same name, which will continue the business. The stock of the new company, it is said, has been heavily oversubscribed.

Kellogg Switchboard Dividend

The Kellogg Switchboard and Supply Company has declared a special cash dividend of 15 per cent, payable June 29 to stockholders of record June 26. The disbursement is made out of proceeds received in an agreement made relating to certain patents of the company.

The dividend, which accounts for the recent rise in the price of the shares to around 360, calls for a disbursement of $251,250 on the $1,675,000 capital stock outstanding. Last January the company paid a 25 per cent stock dividend and a similar stock dividend was distributed in January, 1913. Besides these extras the company has paid regular dividends at the rate of 3 per cent quarterly since December, 1910. Beyond that period several melons were cut.

The Western Electric Company's new publication, "The Making of the Voice Highways," which is descriptive of the manufacture of lead covered telephone cable, is a beautifully printed and illustrated booklet—a real work of art. It will be sent to anyone interested.

Automatics in Australia

The postoffice department of Australia, which is charged with the administration of the entire telephone system of the commonwealth, has just ordered 10,200 lines of automatic telephone equipment from Automatic Telephones (Australasia) Ltd., sole sales agents in Australia for Automatic Electric Company of Chicago. This apparatus is to be installed in eight exchanges of the Sydney district, namely, Mosman, 2,500 lines; Ashfield, 2,000 lines; Burwood, 1,500 lines; Randwick, 1,500 lines; Parramatta, 1,000 lines; Homebush, 800 lines; Lindcombe, 500 lines, and Watson's Bay, 400 lines. These exchanges will have a total ultimate capacity of 27,000 lines.

The first automatic exchange installed in Australia was at Geelong, with 1,100 lines, which was cut into service in May, 1912. The subscribers expressed themselves as so pleased with the automatic telephone, and the engineers in charge found it so well adapted to Australian conditions, that various other exchanges were ordered, among them being Perth, with 4,000 lines, and Brighton, 1,500 lines.

A short time ago the rehabilitation of the Sydney telephone system was undertaken, and automatic apparatus for three of the 29 exchanges operating in that area was ordered. These installations, 2,000 lines at Newtown, 1,700 lines at Glebe and 1,100 at Balmain, are now completed or in course of construction, and make a total of 15,000 lines for the Metropolitan district.

Simplex Steel Taped Cable

Under this title a 16-page booklet has just come from the press which describes briefly the manufacture and uses of the cable which is protected by two steel tapes wound on spirally in reverse directions. Steel taped cable has a field peculiarly its own. It is used where considerations of safety and civic pride will not permit the use of overhead wires, and a conduit system is too expensive.

The book illustrates and describes briefly methods of installing steel taped cable in ornamental lighting systems, parks, the grounds of public buildings, and in railroad and manufacturing yards. It discusses the unusually severe voltage tests to which the Simplex products are subjected and shows by figures from actual jobs how this product has cut underground wiring costs in half. A copy of the booklet will be sent by the Simplex Wire & Cable Company, Boston, to anyone interested.

The Greatest Office Bldg.

The new Equitable building under construction in New York—the largest and heaviest office building yet designed—is to be wired throughout with Simcore, made by the Simplex Wire & Cable Company, Boston. The specifications to date call for a total of more than 400 conductor miles for distributing electric energy and lighting service throughout the mammoth building.

It is estimated that the entire structure when completed will weigh 203,000 tons, of which 36,000 tons is the steel structure. It is about 160 by 312 feet—rises 500 feet above the street and the lowest basement is 65 feet below the street. On a little more than an acre of ground there are more than 27 acres of rentable floor space, served by 50 electric elevators.

"Do it now," does not mean think about it afterwards.

L. G. Le Bourveau of the American Electric Company, Chicago, has almost gone into the motion picture business. The "releases" of his "American Feature Series" are not films, however, but clever advertising folders describing American equipment. "Reel No. 2" describes interestingly the story of the American desk stand—"The *best* desk telephone I *ever* made," says P. C. Burns.

"Reel No. 1," released a short time ago, told similarly of the American wall set.

Both "reels" are illustrated in front with sections of actual motion picture film.

The Brookfield Glass Company has just issued its June bulletin, No. 55. Telephone men will be particularly interested in the two insulators illustrated on page six, Nos. 603 and 604, one a single petticoat, the other double petticoat insulator. These goods were manufactured under special specification and blue print and were designed for one of the licensee companies of the American Telephone & Telegraph Company. This new bulletin received most favorable comment at the Railway Telegraph Superintendents' convention recently held in New Orleans, La., where the company was represented by Arthur Lockwood.

There has just been issued a new catalogue on Western Electric Inter-phones and supplies. This publication, which contains not only catalogue information but helpful suggestions as to the selection and installation of interior telephone systems, has been issued with the hope that it will be of assistance to the electrical dealer and contractor handling this class of work.

The proceedings of the Iowa Independent Telephone Association's convention at Des Moines, March 17 to 19, have been published in book form. So many excellent papers were read and problems discussed at this meeting that the proceedings constitute quite a text-book. Secretary Charles C. Deering, Des Moines Life Building, Des Moines, will answer queries regarding copies.

It has been announced by the Mountain States Telephone and Telegraph Company that leaves of absence will be granted to any of its employes who desire to enter the miltary or naval service of the United States in time of war, and that the time thus devoted would not affect in any way the employes' standing under the pension plan.

A report from an American consular officer states that the manager of a private telephone installation concern in France desires to enter into business relations with American manufacturers of house telephone apparatus. Correspondence may be in English. File No. 13,202, Bureau of Commerce, Washington, D. C.

Kellogg Switchboard and Supply Company is sending out pretty and interesting little folders descriptive of its branch offices. "Kellogg in the Golden West" and "Kellogg in the Central West" are the names of two of them.

The fourth annual meeting of the Telephone Pioneers of America will be held at Richmond, Va., October 29 and 30, 1914, with headquarters at the Jefferson Hotel.

Brevities of the Business

The Activities of the Whole Telephone Field Told in Short Paragraphs

PERSONAL NOTES.

E. H. Bussey, the latest acquisition to the sales organization of the Kellogg Switchboard & Supply Company, is a native Georgian. He was associated with the company which constructed the first telephone plant in Randolph county, Georgia, this having been one of the earliest independent telephone plants in the southern states. He received his technical education at the Georgia School of Technology at Atlanta, Ga., and after graduating took a telephone engineering student's course with the engineering department of the Southern Bell Telephone & Telegraph Company at Atlanta. After the completion of this course he was assigned to an engineering inspector's place, which position he resigned to accept the management of the Georgia-Alabama Telephone Company at Dawson, Ga. Just at this time the Western Electric Company entered the field for the sale of telephone apparatus to independent plants, and on account of Mr. Bussey's wide experience, his services were secured by the Atlanta branch of the Western Electric Company as sales engineer of that house. This position was retained for a period of seven years, when he resigned to accept his present place with the Kellogg company. Mr. Bussey will handle the states of Georgia and Florida for the Kellogg company, making his headquarters at Jacksonville, Fla. On account of his wide acquaintanceship with the southern telephone field his friends predict for him a marked success in his new activities.

The Michigan State Telephone Company has appointed P. E. Ganson of Jackson manager of the Grand Ledge office.

L. L. Cleaves has resigned as division advertising manager for the New York Telephone Company at Syracuse and will become head of the advertising and business promotion department of the Astor Trust Company of New York. Mr. Cleaves will leave Syracuse July 4.

Charles H. Swift, formerly cashier for the Stark Telephone Company at Canton, Ohio, was made manager of the Alliance branch of the company, succeeding F. D. Miller.

J. F. Rossman, formerly plant chief of the Bell Telephone Company at Havana and Lewistown, Ill., has resigned his position.

Charles F. Rood of the Citizens Telephone Company at Grand Rapids, Mich., who has been ill for some time, is reported to be in a serious condition.

W. B. Manson, superintendent of equipment of the Mountain Home Telephone Company at Plattsburg, N. Y., has resigned to accept the position of assistant general manager of the Consolidated Telephone Company of West Virginia with headquarters at Wheeling.

Among the passengers arriving on board the new Cunard liner *Aquitania* on June 5 was Charles E. Scribner, chief engineer of the Western Electric Company. Mr. Scribner, who had been abroad for two months, went to Europe primarily to appear in London before a parliamentary commission to present data regarding the new long distance, high speed printing telegraph developed under his supervision. His presentation resulted in an order for a trial installation, for which the equipment is already in process of manufacture. During his stay in Europe Mr. Scribner also inspected and tested the new duplex cable installed by the German Reichspost between Berlin and Madgeburg. These tests indicated that in this important branch of telephone work the United States is substantially ahead of Europe.

After serving seventeen years as manager of the Home Telephone Company in New Albany, Ind., Frank Beaucond has tendered his resignation.

F. A. Hazelbaker has resigned his position as secretary of the Southern Montana Telephone Company at Dillon, Mont. He will be succeeded by C. B. Vaughn of Hamilton.

R. J. Heller, who has been manager of the Bell Company at Bowling Green, Ohio, for two years, has been promoted to the position of manager at Galion, succeeding Ferd J. Meisen, who has resigned to go into the electrical construction business in Detroit.

Frank Pearce, local manager for Home Telephone Company at La Grange, Ky., fell from a pole on which he was working, sustaining severe bruises and a badly sprained ankle.

Earl Walker, the principal stockholder and president of the Carroll Telephone Company at Delphi, Ind., died in a sanitarium in Shelbyville June 9.

P. J. Reilly has been promoted to the position of superintendent of construction for the Mountain Home Telephone Company at Plattsburg, which gives him supervision over the construction work in northern New York, comprising the counties of St. Lawrence, Franklin, Clinton and Essex.

L. R. Pomeroy, a railway and electrical engineer of prominence, has been appointed manager of the New York sales office, 16-24 West Sixty-first street of the U. S. Light & Heating Company, the general offices of which are now at Niagara Falls, N. Y. Mr. Pomeroy has under his direction the sales of the U-S-L axle electric car lighting equipment, U-S-L electric starter and lighter and U-S-L storage batteries in the territory of the New York branch office.

On June 6 Gerard Swope, vice-president and general sales manager of the Western Electric Company, sailed for Europe on board the *Imperator* for a business trip in the course of which he will visit the company's various allied interests abroad. Mr. Swope will be gone for two months.

C. J. Rapparlie, formerly manager of the Bell Company at Defiance, Ohio, and who has recently been doing special work at the Toledo exchange, will be made manager at Bowling Green, succeeding R. J. Heller.

E. R. Couzens was made manager of the Garden City exchange of the Bell telephone system at Missoula, Mont., succeeding Orma Bigelow, who has been transferred back to Anaconda as manager of the exchange there.

W. B. T. Bell was chosen vice-president and general manager of the Nebraska Telephone Company of Omaha at a meeting of the board of directors held a short time ago.

Charles Wesner has resigned his position as lineman with the Memphis Telephone Company at Memphis, Tenn., and has left for Barlow, N. D., where he assumes management of an exchange.

H. E. Davis, traffic manager of the Home Telephone Company at Joplin, Mo., for the last two years, has been promoted to a similar position in the Home office at Kansas City, effective July 1.

Many of our readers who are well acquainted with A. E. Barker, for many years with the Dean Electric Company of Elyria, Ohio, and for a long period actively engaged in telephone promotion work, will be interested to learn that Mr. Barker has become affiliated with Dodge Bros., Detroit. He will be Cleveland district representative for that company, having charge of sales in sections of Ohio, New York, Pennsylvania, West Virginia and Maryland. Dodge Bros., who since the early days of the motor car industry have manufactured parts on a very large scale, are to market a motor car of their own make in the fall.

NEWS FROM THE FIELD.

ALABAMA.

June 3 the Alabama Great Southern Railroad started dispatching trains by telephone between Birmingham and Meridian, a distance of 152 miles. The telephone line is being fast completed between this city and Chattanooga, a distance of 143 miles, and when completed the entire Alabama Great Southern line, in length 295 miles, will be equipped with the telephone.

The Home Telephone & Telegraph Company of Aliceville is preparing to make some extensions to its plant.

ARKANSAS.

The city council recently passed an ordinance granting to

Edward Cronk a franchise to operate a telephone system in Conway for a period of thirty years.

CALIFORNIA.

The organization of the Willow Creek & Grasshopper Mutual Telephone Company assures the people of Adin and of Willow Creek valley of a telephone. Temporary officers of the company have been elected as follows: C. A. Williams, president; Ward Hurlbut, secretary; Ed Murrer, treasurer.

The Sunset Telephone Company is cabling its lead lines into Dixon, the cables carrying 200 wires each.

CANADA.

The Bell Telephone Company of Canada has declared a regular quarterly dividend of 2 per cent, payable July 15 to stock of record June 24.

COLORADO.

The new telephone line to Beulah, which is being built by the county along the Beulah road, is nearing completion.

IDAHO.

At a special meeting, the Home Telephone Company purchased the old Genessee Telephone Company for $8,055. The officers of the new company follow: A. W. Beachler, president; John Meyer, vice-president; C. P. Whalen, secretary-treasurer; D. Scharnhorst, Anton Bergen, Christ Lange, James Tobin, directors.

ILLINOIS.

The Chicago Title and Trust Company filed a bill in the United States District court June 15, asking for the appointment of a receiver for the Interstate-Independent Telephone Company of Aurora. The bill charges that the telephone company is insolvent.

An ordinance was passed by the city council of Genoa revoking the franchise granted the DeKalb County Telephone Company, because of the latter's refusal to remove poles from one of the streets as ordered by the council.

The Chicago Telephone Company appeared as the purchaser in two transactions filed for record recently, which will be improved with exchanges. The properties comprise 126 by 177 feet on Monroe avenue eighty-two feet south of Sixty-first street, and 101 by 125 feet at the southeast corner of One Hundred and Thirteenth street and Berry avenue, Chicago.

The Chicago Telephone Company is now located in its new quarters in the Telephone Exchange building in Centerville.

A meeting of the stockholders of the Avon Mutual Telephone Company was held and Dr. S. S. Clayberg, George Simmons and D. M. Stump were re-elected for a term of three years.

INDIANA.

The telephone properties at Vernon and North Vernon and the rural lines in Jennings county have been acquired by L. C. Griffiths, of Seymour, and associates, who now control the Seymour Telephone Company and several other telephone properties in southern Indiana and Kentucky.

The New Washington Telephone Company, New Washington; capital stock, $10,000; telephones; directors, Henry F. Schowe, A. R. Miles and Thomas R. Stevens.

IOWA.

The Mt. Pleasant Telephone Company suffered a loss of $1,000, June 17, by a severe fire, which threatened the city of Mt. Pleasant.

Seventy-five men are now at work installing the underground conduits of the Tri-City Automatic Telephone Company in Davenport.

Telephone poles are being placed for the new toll line from Blockton to Bedford.

The Farmers and Merchants Telephone Company, having purchased the stock of the Hawarden Telephone Company, will immediately proceed to rebuild and install in Hawarden one of the latest and most up-to-date telephone systems in the country. The Farmers and Merchants Telephone Company is a half million dollar corporation, incorporated in South Dakota, and its officers are W. J. Brownell, president; John Lindberg, of Union county, S. D., vice-president, and L. G. Brownell, secretary and treasurer.

KANSAS.

The management of the Turon telephone exchange has been making many improvements upon its lines both in the city and country.

At the annual meeting of the Princeton Telephone Company officers were elected to succeed themselves with one new trustee. President, Robert McGinnis; vice-president, Earl Elliott; treasurer, C. E. Blouch; secretary, Dr. Woods; trustees, S. D. Henderson, Horatio Tawney and Lew Eggleston. Board of control, George Garst, Henry Martin, Earl Elliott and C. E. Blouch.

Permission was granted by the public utilities commission to the Scandia Telephone Company to issue $10,000 worth of stock to liquidate its indebtedness and for extensions and improvements.

G. A. Swallow has bought the two telephone systems at Meriden and will, it is supposed, merge the two, the Independent and the Mutual.

KENTUCKY.

The Cumberland Telephone and Telegraph Company of Winchester has completed the removal of its downtown offices from the Parrish building at the corner of Main and Fairfax streets to its new plant on Maple street.

LOUISIANA.

A recent fire destroyed the telephone exchange at Mandeville.

MONTANA.

At the annual meeting of the Gallatin-Madison Telephone Company at Manhattan, W. H. Sales was chosen president; Charles Scollard, vice-president; E. B. Burket, secretary; R. H. Dean, treasurer, and Peter Alberda, Thomas D. Tice, Frank Jakle, S. Scanlon and George M. Lewis, directors.

MICHIGAN.

The new north end branch exchange of the Citizens' Telephone Company at Plainfield avenue and Caledonia street, N. E., Grand Rapids, is completed and has been put into service. The building cost about $8,000 and its equipment about $9,000. It will accommodate 400 subscribers.

The Michigan State Telephone Company, Grand Rapids, has sold to the West Michigan Cadillac Company a private branch exchange.

The new exchange of the Michigan State Telephone Company in the Masonic Temple at Houghton was cut-over in one minute and forty-seven seconds.

Owens & Niewenkamp, contractors, have been awarded the contract for the construction work on the new telephone exchange building to be erected on Lowell street, Ironwood, by the Michigan State Telephone Company. The building is to be of brick, 30 by 40 feet, and will cost approximately $11,000. Work is to be commenced at once, as the building is to be completed by August 15.

The Farmers' Telephone Exchange in the village of Brooklyn was destroyed by fire.

The Michigan state railroad commission has dimissed the Michigan State Telephone Company's petition asking that it charge increased rates and established metered service in Detroit.

The state railroad commission has issued an order requiring the Michigan State Telephone Company to make a physical connection at its Traverse City exchange with the Citizens' Telephone Company. Thirty days is allowed for the work to be completed, the expense of making such connection to be borne by the Michigan State and Citizens' Company jointly. In two other orders issued, the commission requires the Valley Home Telephone Company of Saginaw to make a physical connection with the Consolidated Telephone Company at Bad Axe and also requires the Valley Home to make physical connection with the John Burns Telephone Company at Kingston, the John Burns being a privately owned company.

Within a short time a contract will be entered into between the Postal Telegraph Company and the United Home Telephone Company whereby the Postal Telegraph gives up its pole line between Muskegon and Grand Rapids and hereafter does its business over a United Home line.

To improve and increase Bell telephone facilities in Battle Creek, the Michigan State Telephone Company will expend $125,000 this year. Telephone subscribers in all parts of the city will benefit by the proposed improvements.

MISSOURI.

Rapid progress is being made by the Missouri & Kansas Telephone Company in installing improvements in Chillicothe that will cost approximately $35,000.

MINNESOTA.

The village council has granted a franchise to Frank McDonald for the construction and maintenance of a local telephone system in Brookston. The term of the franchise is 10 years, and McDonald promises to have the system in operation within three months.

Articles of incorporation of the Excelsior Rural Telephone Company, at Fergus Falls, were filed recently. The officers of the company are as follows: President, Fred Lother; vice-

president, Albert H. Beske; secretary and treasurer, J. M. Quam.

MONTANA.

The telephone system in th Helena national forest is to be extended. The line now ends at Nelson and the new line will extend from there across Big Belt divide to Watson, going via Confederate gulch road.

Pleasant Valley ranchers have planned a neighborhood telephone circuit to connect themselves and eventually to give them service over trunk lines into Kalispell.

The Eureka Mutual Telephone Company has received a shipment of cedar poles from Sandpoint to be used in extending the line from the "69" ranch north to the international boundary and thence west to Gateway.

The Havre Electric Light and Telephone Company is to build a modern office on Second street, Great Falls.

The Montana Independent Telephone Company held its annual meeting in Butte City and re-elected the old board of directors and officers. The officers are as follows: Thaddeus S. Lane, president; John MacGinniss, vice-president; John F. Davies, secretary; D. J. Fitzgerald, treasurer; H. H. Risley general manager; F. E. Farwell, assistant general manager. The gentlemen named compose the board of directors.

NEBRASKA.

The Crawford Telephone Company of Pierce has been given permissin by the railway commission to issue $100 of stock to pay for the construction of half a mile of telephone line.

The Lincoln Telephone and Telegraph Company's lines were badly damaged in the vicinity of Benedict and Hampton by a recent storm.

The Independent Telephone Company installed another new line in Divide.

The little town of Graf is to have its own telephone system and work has begun on the construction of same. The poles are all set and the wires are being strung for the line. The location for the central office has not been decided upon.

The Platte Valley Telephone Company of Scottsbluff has been authorized by the state railway commission to reduce the toll rates between Gering and Mitchell from 25 cents to 15 cents.

Heavy rains in Wayne and Dakota counties caused many washouts and several telephone poles were washed away.

The building for the Lincoln Telegraph and Telephone Company in Greenwood is completed and the installation of the new switch board with the new metallic service is progressing rapidly.

NEVADA.

The Bell Telephone Company has announced that its station in Nevada for repeating messages between California and Eastern cities will be located in Vinnemucca instead of at Reno.

The Blaine County Telephone & Telegraph Company, of Danning, is preparing to extend its lines.

NEW YORK.

The New York Telephone Company has installed a 90-line telephone switchboard and exchange in the second floor of the new Central station in Utica.

It has been announced by George R. Fuller, president of the Rochester Telephone Company, that 90 per cent of the general mortgage bondholders of the company has consented to surrender their interest coupons for a period of two years in order that the company might use $100,000 for much needed extention work. The work has been started and, Mr. Fuller states, that two new exchanges are contemplated, one in the northwest and one in the southwest part of the city.

A new exchange is now open in the old Chesla district in the lower West Side of New York, and the title bestowed by the telephone company on the newest division is Farragut.

A telephone exchange to be used in connection with five booths was installed in the post office in Albany by the New York Telephone Company.

The Mountain Home Telephone Company is expending about $4,000 on the local exchange at Watertown.

A cable manhole is being constructed by the New York Telephone Company in front of its Main exchange in North Fitzhugh street, Rochester. The manhole will take care of connections necessitated by the installation of a new switchboard. It is six feet deep, 26 feet long and eight feet wide.

An order has been granted by the public service commission, second district, at Albany, authorizing the Federal Telephone & Telegraph Company of Buffalo to issue $500,000 of preferred stock to reimburse the treasury of the company for moneys expended from the local concern's income in the last several years. It is the purpose of the company to sell stock to provide funds for the further extension of the property now made necessary by the installation of the automatic telephone service.

NORTH CAROLINA.

The Camden Telephone Company, incorporated, with W. S. Berry, president; M. W. Ferebee, vice-president and general manager, and G. C. Boswood, secretary and treasurer, has been chartered to establish a line in the lower part of Camden county, and to Gregory and Shawboro in Currituck county. The line will also connect with the Elizabeth City line and with the Williams line to South Mills, giving the people of Camden county telephone connections with the outside world.

OHIO.

About $20,000 is to be expended on extensions to the Stark County Telephone Company's service in Canton if the proposed merger with the Ohio State Telephone Company, which was approved by the directors of the Stark company at a meeting held recently, is approved by the state utilities commission. These extensions were promised by G. R. Johnson, of Columbus, general manager of the United States Telephone Company, who attended the meeting of directors.

By the terms of a contract entered into between the United States Telephone Company and the Jackson County Home Telephone Company, all the villages in Jackson county will get long-distance service over the United States Company's lines. Negotiations for the entrance of the United States Company into Jackson county have been under way for several months.

$300,000 will be spent by the Ohio State Telephone Company, under organization now, in Dayton and vicinity, for the purpose of enlarging the service and increasing the efficiency of the local company.

Mortgage for $32,000 given by the Central Union Telephone Company to Charles A. Gump on property the latter acquired for a new telephone exchange on the south side of Second west of Ludlow, Dayton, was cancelled June 5.

Architect Harry Hake has awarded to Oscar Schawver the general contract for the construction of a $25,000 building for the Madisonville branch of the Cincinnati and Suburban Bell Telephone Company.

The local telephone company at Bucyrus had 300 phones put out by a recent storm.

OKLAHOMA.

The Pioneer Telephone Company is spending many thousand dollars laying new lines and improving its service in Tulsa. The work of putting telephone cables throughout the business district underground is rapidly being completed.

OREGON.

The Home Telephone & Telegraph Company will have its new Sunnyside exchange building, East Forty-fifth and Madison streets, Portland, ready for use by August 1. The construction contract has been let to the Hurley-Mason Company. The building will be of reinforced concrete and cost about $10,000.

The Pacific Telephone & Telegraph Company has a force of men at work, with headquarters at Clatskanie, removing its lines from along the Columbia River highway route. The men are working toward Ranier.

PENNSYLVANIA.

After fifteen years' controversy and after three different Burgesses of West Chester vetoed the ordinance, the Bell Telephone Company has commenced digging trenches for its proposd conduit in the streets of West Chester, following the passage of the ordinance over Burgess MacElree's recent veto.

The Bell Telephone Company is about to expend $15,000 in improvements to its system in Scranton. This announcement was made recently when it was learned that the estimate covering the cost of the proposed improvements had been approved by the heads of the company. The greater part of the money will be spent in adding 24,500 feet of aerial cable to the local equipment.

The contract has been let by the Bell Telephone Company for its new Parkway Central office building, located on the Parkway at the intersection of Seventeenth street, Philadelphia. The building will be fifteen stories in height and will be an impressive fireproof structure, of granite and terra cotta facades, gray in color and in entire conformity with the plans for the development of this most important of the city's boulevards. The ground space to be occupied is 157x68 feet.

Application of the Central District Telephone Company to list $10,000,000 first mortgage 30-year five per cent bonds on the Philadelphia Stock Exchange, has been approved by the Governing committee.